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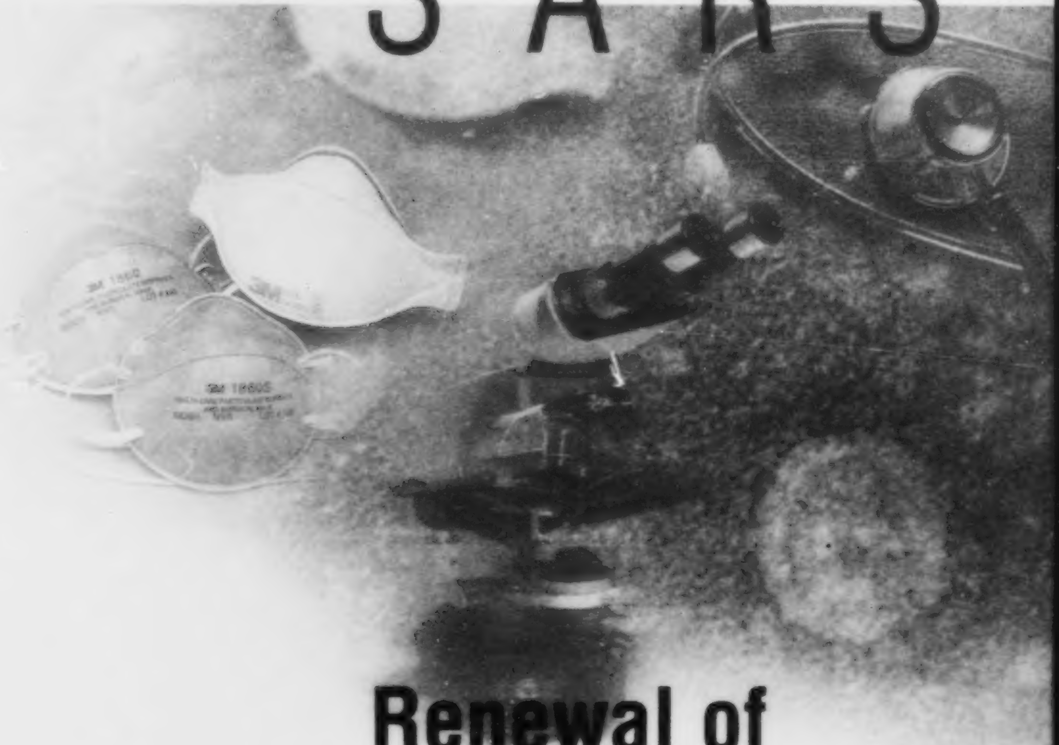

Renewal of Public Health in Canada

Canada

Learning from SARS

Renewal of Public Health in Canada

A report of the National Advisory Committee on SARS and Public Health
October 2003

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* The Committee was materially assisted through corresponding members of the US Centers for Disease Control and Prevention and Dr. David Heymann of the World Health Organization.

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PREFACE

The National Advisory Committee on SARS and Public Health was established in early May 2003 by the Minister of Health of the Government of Canada, the Hon. A. Anne McLellan, in the circumstances surrounding the outbreak of Severe Acute Respiratory Syndrome [SARS]. The Committee's mandate was to provide a "third party assessment of current public health efforts and lessons learned for ongoing and future infectious disease control."

The Minister asked the Committee to build on current public health interventions, and to foster and encourage collaboration among jurisdictions, professionals, and institutions. We were urged to work towards integration of all aspects of the containment of SARS (epidemiology, management, communication, and international coordination). The outbreak of SARS in the Greater Toronto Area was contained during our mandate, as expected. Therefore, we extended this integrative approach to our analysis, and recommendations regarding emerging infectious diseases and public health in general.

Most of this report deals with two major elements of our mandate: provision of a short-term assessment of lessons learned from current public health interventions to contain SARS, and advice regarding issues for necessary longer-term action regarding infectious disease control and prevention.

We learned very rapidly that Canada's ability to fight an outbreak such as SARS was tied more closely to the specific strengths of our public health system than to the general capacity of our publicly-funded personal health services system. By public health, we refer to systems that are population-focused, and include functions such as population health assessment, health and disease surveillance, disease and injury prevention (including outbreak or epidemic containment), health protection, and health promotion. Our analysis and our recommendations accordingly set out a plan for a comprehensive renewal of both the public health system in general, and the nation's capacity to detect, prevent, understand, and manage outbreaks of significant infectious diseases.

The Committee went about its data gathering and analysis in the following way.

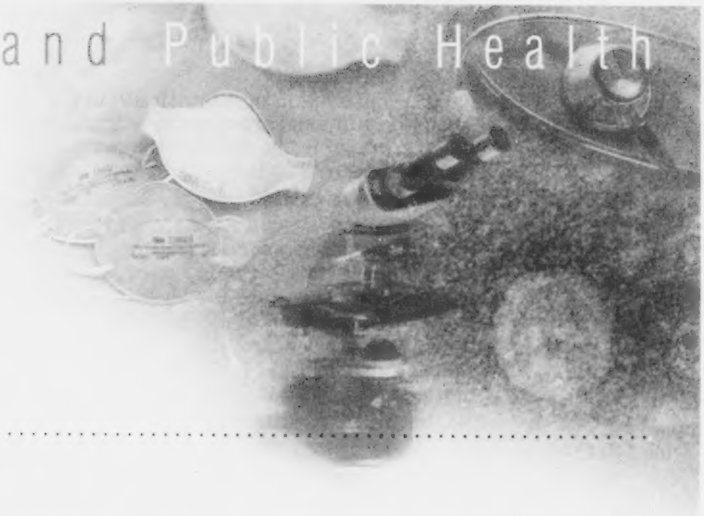
We reviewed a broad range of source documents, research, and reports from Canada and other countries applicable to SARS, communicable disease control, and public health infrastructure more generally. The chair and a staff member personally interviewed in person or by telephone a range of informants involved in the Toronto outbreak. The Committee's deliberations were also greatly assisted by one full-time policy and research advisor, and two part-time research/editorial associates.

Two key reports were solicited from outside consultants. One, by Prof. Sujit Choudhry of the University of Toronto Faculty of Law, dealt with legal issues, including the difficult question of jurisdictional authorities. With permission, we borrow directly from Prof. Choudhry's report in this document, although it should not be assumed that he would agree in all respects with the conclusions we have drawn from it. The other consultancy, by the Hay Health Care Consulting Group [the Hay Group] in Toronto, entailed interviews, a survey, and an analysis of hospital service profiles, to provide an overview of the preparedness of the Greater Toronto Area health system to respond to SARS, the gaps perceived by stakeholders, and the steps that had been or might be taken to improve responses to infectious outbreaks in future. We worked with the Hay Group to incorporate their findings directly into our report. Health Canada's Office of Nursing Policy organized roundtables with front-line health care workers; the findings from that valuable exercise have also been incorporated into the report.

Discourse among members involved about thirty hours of face-to-face meetings, and a substantial amount of electronic and telephone traffic. We live, work, and pay taxes in several different provinces. The members of the Committee represent a multitude of disciplines and perspectives, and several were directly involved in responding to SARS in diverse capacities.

As noted in the Acknowledgements, our work was informed not only by our own experience and that of our colleagues, but by the many non-governmental and voluntary sector stakeholders who wrote briefs, letters, responded to requests for interviews, and provided information that enriched our deliberations and recommendations. In this regard we reviewed approximately 30 written submissions (see report appendix for list).

We also requested preparation of extensive background documents from Health Canada staff in the Population and Public Health Branch. The Committee was allowed direct and unfettered access to leading professionals in the Branch who in turn were given explicit licence to offer their expert opinions and advice, unconstrained by the normal reporting hierarchy. Some senior staff drafted material for the report itself. All such material was first revised by staff as per the Committee's requests, then edited or rewritten extensively by the Committee members.



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EXECUTIVE SUMMARY

Mandate of the Committee

The National Advisory Committee on SARS and Public Health was established in early May 2003 by the Minister of Health of the Government of Canada, the Hon. A. Anne McLellan, in the circumstances surrounding the outbreak of Severe Acute Respiratory Syndrome [SARS]. The Committee's mandate was to provide a "third party assessment of current public health efforts and lessons learned for ongoing and future infectious disease control." Committee members represented a multitude of disciplines and perspectives from across Canada. Several were directly involved in responding to SARS in different capacities. We reviewed source documents, conducted interviews, and engaged consultants to undertake surveys, additional interviews, and analyses to illuminate aspects of the SARS experience. Advice was also sought from a constitutional legal expert. Over 30 non-governmental and voluntary sector stakeholders submitted helpful briefs and letters.

SARS in Canada

SARS is a droplet-spread viral illness, apparently caused by a novel coronavirus. Emerging in China in November 2002, SARS spread across the globe over the course of several weeks. About 8,500 persons worldwide were diagnosed with probable SARS during the epidemic, and there were over 900 deaths. SARS remains a challenge to diagnose and manage because its symptoms resemble those of many other respiratory infections. SARS was managed primarily by supportive measures for those affected, with isolation and infection control precautions in hospital, as well as tracing and quarantine of contacts. Diagnosis rested on the clinical syndrome, a link to known cases of SARS, and a process of exclusion. Available laboratory tests were not consistently helpful during the acute phase of the illness.

Outside of Asia, Canada was the country hardest hit by SARS. As of August 2003, there had been 438 probable and suspect SARS cases in Canada, including 44 deaths. The majority of SARS cases and all deaths were concentrated in Toronto and the surrounding Greater Toronto Area [GTA]. The toll on health care workers was high: more than 100 became ill and three succumbed.

Public health and health care workers in Ontario and British Columbia did an admirable job of containing SARS. Health care workers caring for SARS patients were at heightened risk for contracting a new and dangerous disease, and worked under physical and psychological stress. Lack of certainty about diagnosis and treatment added to the clinical challenges. SARS also placed unprecedented demands on the public health system, challenging regional capacity for outbreak containment, surveillance, information management, and infection control.

A great many systemic deficiencies in the response to SARS were identified as the Committee went about its task. Among these were: lack of surge capacity in the clinical and public health systems; difficulties with timely access to laboratory testing and results; absence of protocols for data or information sharing among levels of government; uncertainties about data ownership; inadequate capacity for epidemiologic investigation of the outbreak; lack of coordinated business processes across institutions and jurisdictions for outbreak management and emergency response; inadequacies in institutional outbreak management protocols, infection control, and infectious disease surveillance; and weak links between public health and the personal health services system, including primary care, institutions, and home care.

Emerging Infectious Diseases, Globalization, and Bioterrorism

SARS is only the most recent example of emerging infectious diseases—diseases that are newly identified, or that have existed previously but are increasing in incidence or geographic range. Since 1973, more than 30 previously unknown diseases associated with viruses and bacteria have emerged. Examples include: Ebola virus (1977); Legionnaire's disease (1977); *E. coli* 0157:H7-associated hemolytic uremic syndrome (1982); HIV/AIDS (1983); Hepatitis C (1989); variant Creutzfeldt-Jakob disease (1996); and H5N1 Influenza A or avian flu (1997). West Nile virus infection is an example of a disease that has increased its geographic range. As well, some known infectious diseases, such as tuberculosis, have re-emerged in vulnerable populations.

According to World Tourism Organization data, approximately 715 million international tourist arrivals were registered at borders in 2002. Human migration has been a key means for infectious disease transmission throughout recorded history. However, the volume, speed, and reach of travel today have accelerated the spread of infectious diseases.

Compounding the challenges of dealing with emerging and re-emerging infectious diseases, is the threat of the accidental or intentional release of biological agents as highlighted by the intentional release of anthrax spores in the USA in the Fall of 2001.

Public Health in Canada: Organization and Jurisdiction

Among the functions of public health are health protection (e.g., food and water safety, basic sanitation), disease and injury prevention (including vaccinations and outbreak management), population health assessment; disease and risk factor surveillance; and health promotion. The public health system tends to operate in the background unless there is an unexpected outbreak of disease such as SARS or failure of health protection as occurred with water contamination in Walkerton, Ontario (2000) or North Battleford, Saskatchewan (2001). An effective public health system is essential to preserve and enhance the health status of Canadians, to reduce health disparities, and to reduce the costs of curative health services. Public health also plays a key role in disaster and emergency response.

Primary responsibility for public health services is at the municipal or local level, through about 140 health units and departments that serve populations ranging from 600 to 2.4 million people, with catchment areas from 4 to 800,000 square kilometres. The next level of organization is provincial or territorial. At the provincial/territorial [P/T] level, staff engage in planning, administer budgets, advise on programs, and provide technical assistance to local units as needed. The P/T-level capacity for coordination and technical support of local health agencies varies sharply from one province to the next.

Two provincial models are noteworthy. British Columbia established its Centre for Disease Control in 1997 to take responsibility for provincial-level management of infectious disease prevention and control, including laboratories. Quebec established the National Public Health Institute in 1998 by transferring in staff from several regional public health departments and the ministry; it oversees the main public health laboratories and centres of expertise. The Quebec Institute has a mandate that covers prevention, health promotion, healthy living, workplace health, and chronic disease prevention as well as infectious disease control.

Federal activity is concentrated in the Population and Public Health Branch [PPHB] of Health Canada. PPHB is headquartered in Ottawa, with regional offices across Canada. It includes Centres for Infectious Disease Prevention and Control, Chronic Disease Prevention and Control, Emergency Preparedness and Response, Surveillance Coordination, and Healthy Human Development. PPHB also oversees the National Microbiology Laboratory in Winnipeg and the Laboratory for Foodborne Zoonoses in Guelph. Other branches in Health Canada and other government departments and agencies are involved with public health to a variable extent.

From a constitutional perspective, public health is primarily a provincial concern. However, the federal government has authority to legislate aspects of public health owing to its powers over, variously, the criminal law, matters of national concern for the maintenance of "peace, order and good government", quarantine provisions and national borders, and trade and commerce of an interprovincial or international nature. Behind the formal division of powers is an essential tension in the Canadian F/P/T fabric: much administrative responsibility rests with the P/T level, while revenue generation and therefore spending capacity is concentrated at the federal level. In the latter respect, Ottawa does not currently make any earmarked transfers to other governments for public health. PPHB instead operates a $200 million per annum program of grants and contributions directed to non-profit and non-governmental organizations.

Public Health Capacity and Funding

There have been many calls to strengthen public health infrastructure in Canada over the last decade. For example, in late 1993, given the global spread of HIV, Health Canada organized an Expert Working Group on Emerging Infectious Disease Issues. This 'Lac Tremblant' group called for "a national strategy for surveillance and control of emerging and resurgent infections", support and enhancement of "the public health infrastructure necessary for surveillance, rapid laboratory diagnosis and timely interventions for emerging and resurgent infections", coordination and collaboration in "setting a national research agenda for emerging and resurgent infections", "a national vaccine strategy", "a centralized electronic laboratory reporting system to monitor human and non-human infections", and strengthening "the capacity and flexibility to investigate outbreaks of potential emerging and resurgent infections in Canada". A decade later, very similar recommendations are repeated in our report.

In 1998, Mr. Justice Horace Krever provided a general call to improve public health in his report of the "Commission of Inquiry on the Blood System in Canada". An F/P/T report on Public Health Capacity was prepared at the request of the F/P/T Conference of Deputy Ministers of Health, and presented to them in June 2001. It highlighted the weaknesses in public health infrastructure across Canada, pointing to disparities in capacity from one province to the next; concerns about the relative low priority given to longer-term disease and injury prevention strategies; weaknesses in human resources for public health; and growing recruitment/retention difficulties. In 2002, the Romanow Commission recommended a national immunization strategy, a physical activity strategy, and strengthening prevention programs. The Standing Senate Committee on Social Affairs, Science and Technology chaired by Senator Michael Kirby also reported in 2002. The Senate Committee called for the federal government to commit $125 million annually towards chronic disease prevention. It also cited inconsistent funding, poor coordination among jurisdictions, and an overall lack of accountability and leadership, in recommending additional funding of $200 million annually to enhance public health infrastructure across Canada.

Given variation in accounting, it is difficult to generate a precise estimate of current public health spending in Canada. We roughly estimate total public health expenditures in Canada (2002 - 2003) to range from $2.0 to $2.8 billion depending on the definition used. Total health spending in 2002 was $112.2 billion for the public and private sectors combined, and $79.4 billion for the public sector alone. Public health therefore accounts for 1.8% to 2.5% of total health expenditures, and 2.6% to 3.5% of public expenditures. Provincial spending clearly varies, but so do methods of accounting at the provincial level.

International Models

Australia and the USA are federations with constitutional division of powers similar to Canada. The US Centers for Disease Control and Prevention [CDC] has an international reputation for excellence in public health. Over 2,000 of the approximately 8,600 full-time equivalent employees work outside the CDC headquarters in Atlanta; this includes postings to 47 state health departments.

Although it is best known for investigating disease outbreaks, the CDC is actually a broad public health agency; and much of its budget is directed to an extensive system of federal grants and transfers to states and municipalities in support of public health infrastructure. The CDC works with states to set and monitor standards. It oversees a national health alert and surveillance system, a national workforce development and continuing education initiative for public health practitioners and related laboratory personnel, and a public health information network. The CDC's National Public Health Laboratory System develops policies and public-private partnerships for improved and timely reporting of laboratory results.

In Australia, the federal government pays for half of public health services—30% via direct expenditure and 22% via transfers to states and territories. Joint public health activities are coordinated through the National Public Health Partnership under the auspices of the federal and state/territorial health ministers. The Partnership has clear priorities such as: improving public health practice; developing public health information systems; reviewing and harmonizing public health legislation; implementing public health workforce initiatives; strengthening national public health research and development capacity; enhanced coordination of national public health strategies; and developing standards for the delivery of core public health strategies. Federal transfers occur through Public Health Outcome Funding Agreements that have targets and reporting requirements. A national program for public health education and research funds Australian tertiary institutions to strengthen post-graduate education and training.

The USA and Australia, as well as the UK, each have a coherent chain of policy, stretching from legislation, national goals and priorities, national strategies, programs to sustain the public health infrastructure (including human resources), means of reaching agreement between stakeholders, and specific funding programs. There are targets with timelines and accountability mechanisms. In contrast, Canada does not have national health goals, a related strategy, or programs of federal transfers to facilitate implementation of a national strategy.

A New Canadian Agency for Public Health

The current federal arrangement puts public health professionals inside a very large department with a highly process-oriented culture geared to meeting the political issues of the day. Vesting those functions in an arm's-length agency would enhance the credibility and independence of federal activities in public health, and offer more flexibility in terms of employment and partnerships with NGOs. An agency could also better foster a collaborative F/P/T culture rooted in shared expertise among public health professionals. The creation of an agency cannot depoliticize interactions among jurisdictions, but it can reduce the chances that the health of Canadians would inadvertently be held hostage in a jurisdictional disagreement among levels of government. Among our key recommendations therefore is that the Government of Canada create a new Canadian Agency for Public Health, led by a Chief Public Health Officer of Canada.

A Canadian Agency for Public Health is arguably best structured as a *Legislated Service Agency*, analogous to the Canadian Food Inspection Agency, the Canadian Institutes of Health Research, or Statistics Canada. The Chief Public Health Officer of Canada would be the chief executive of the new federal agency and report directly to the federal Minister of Health. The Chief Public Health Officer of Canada would also issue an annual report on the state of the public's health and the public health system.

Public health agencies, centres, and institutes around the world vary in their scope. It is premature for the Committee to recommend precisely which activities and programs should be included at this point, beyond indicating our support for a strong and integrative organization. A systematic review is required to establish the scope of the new agency. A more effective approach to continuing challenges in First Nations and Inuit health must be considered as part of any scoping process. Centralizing the agency in a single new location would be disruptive for existing staff and fail to capitalize on the full range of opportunities for partnership in P/T and municipal jurisdictions. We recommend instead selective expansion of activities in Ottawa, Winnipeg, and other existing sites, along with deliberate devolution of some core functions to new locations across Canada. An effort should be made to co-locate federal agency hubs with provincial and regional centres of excellence in public health. Activities in these sites would thus become mutually reinforcing, and help foster a common F/P/T culture focused on protecting the health of Canadians.

We also recommend that, as an early priority, the new agency initiate the collaborative development of a national public health strategy. The strategy should include specific health targets, benchmarks for progress towards them, and collaborative mechanisms to maximize the pace of progress. In developing a national strategy, the new agency must not only work with P/T jurisdictions and other federal departments and agencies, but consult widely with stakeholders in the broader health community. The current program of transfers to NGOs should also be reviewed and aligned with the national health strategy.

The Committee further recommends the prompt creation of a National Public Health Advisory Board to advise the Chief Public Health Officer of Canada on the most effective means to create and implement the above-noted national public health strategy. The nomination process should build pan-Canadian collaboration by involving existing F/P/T networks and advisory committees. Members would be appointed to limited terms by the federal Minister of Health.

Many core functions of the new agency can be developed simply by transferring in current activities and capacity. Relevant core functions directly within PPHB currently cost about $187 million per annum (2002 budget). Adding in extant grants and contributions that amount to contracted-out functions, we reach $225 million as a rough estimate of spending on core functions within PPHB. About $75 million of the costs of operations in other branches of Health Canada could also fall within a new agency's mandate, for a notional total of $300 million spent in 2002.

The Committee has recommended that the current core functions be expanded to include greater investments in: disease surveillance systems; health emergency preparedness and epidemic response capacity; a major and urgently-needed program of development of public health human resources; substantial augmentation of research spending; enhancement of federal laboratories;

capacity-building partnerships with provincial and hospital laboratories pending other F/P/T investments; and coverage of relatively neglected areas such as environmental health, mental health, injury prevention, and public health ethics.

These activities will require gradual increases in budget for core functions. The additional spending is projected to reach $200 million dollars per annum within 3 to 5 years. A proportion of these new monies for core functions would flow to extramural partners, e.g., in support of research programs allied with the Canadian Institutes of Health Research [CIHR], for salaries of federal personnel seconded into P/T public health agencies as per the CDC model, and to create new academic, institutional, and NGO partnerships for human resource development.

Federal Funding to Renew Public Health across Canada

A stronger federal presence in public health, vested in a new agency with enhanced intramural and extramural capacity, would only go partway to remedying the deficiencies evident during the SARS outbreak. Public health in the first instance is a local enterprise. Provinces and territories in turn must fund, support, and coordinate local activities through their own agencies and ministries. As a corollary, the containment of SARS was clearly dependent on local and provincial efforts in Ontario and British Columbia. Even greatly enhanced technical support and outbreak investigation by a federal agency will be somewhat irrelevant if the local and regional capacity for outbreak response is weak. The public health infrastructure needs strengthening at all levels, and this in turn suggests the need for earmarked federal funding that is not currently provided.

Public health did not figure directly in the two F/P/T Health Accords reached in September 2000 and February 2003. The first Accord provided $23.4 billion in new federal funds for the six-year period from 2000-01 to 2005-06. The second provided for $34.8 billion ($30.9 billion new monies) in federal funds for health for the five-year period from 2003-4 to 2007-8. While billions of dollars were earmarked for personal health services, the two Accords together appear to include over $20 billion in non-earmarked transfers that could be used by P/T jurisdictions in part for spending on public health infrastructure.

The availability of these funds underscores our assumption that any new federal spending on public health should be matched in some respects by P/T spending. But without earmarked federal monies for public health, P/T spending will be drawn, as always, to personal health services and opportunities for leverage and coordination will be lost.

As an alternative to new federal transfers, some may argue that the federal government should simply pass legislation that imposes obligations on provinces and territories with respect to disease surveillance or public health emergencies. Arguments in constitutional law can indeed be made for more federal intervention in public health. However, federal legislation that sought to conscript P/T personnel or unilaterally regulate their activities would lead to unfunded mandates and F/P/T political and legal confrontations.

Thus, following the Australian and US models, the Committee is recommending a comprehensive set of funding arrangements and processes designed to facilitate F/P/T collaboration. The goal of these transfers is to create a seamless multi-tiered public health system, knitted together by inter-governmental agreements and harmonized legislation or regulation.

The Committee explicitly rejected the concepts of either passive transfers without accountability or block funding that could become a flashpoint for F/P/T disagreement. Instead, we have endorsed a depoliticizing strategy in which new federal funding flows through the new agency to P/T and municipal jurisdictions, targeting programs and activities according to agreements among public health professionals. The Committee firmly believes the new agency's impact will be strongly dependent on its ability to flow federal funds in support of front-line (local) and P/T public health agencies. Absent an ability to fund or co-fund programs with those governments and agencies that have primary constitutional responsibility for public health, a new federal agency will almost certainly be resented as an irrelevant job creation program staffed by technical experts who are better at talking to each other than supporting serious front-line work. And absent meaningful and earmarked federal funding, Canada's public health infrastructure will remain a flimsy patchwork.

The Committee has therefore recommended three programs of transfers with a total value that will rise, over the course of several years, to a target level of $500 million per annum: $300 million per annum for a Public Health Partnerships Program to build general capacity in public health at the local/municipal level; $100 million per annum targeted at communicable disease surveillance and control with a particular emphasis on P/T level or second-line capacity; and $100 million per annum to bolster the currently underfunded National Immunization Strategy. These funds could be combined and managed according to the Social Union Framework Agreement, thereby giving more flexibility for federal and P/T officials to align transfers with both P/T needs and the national strategic plan for public health.

Communicable Disease Control and Health Emergency Management

Health surveillance involves the tracking and forecasting of important health events or determinants through the continuous collection of relevant data, and the creation and dissemination of reports, advisories, alerts, and warnings as needed. The 1999 and 2002 reports of the Auditor General of Canada raised serious questions about the F/P/T collaborative framework for infectious disease surveillance and outbreak management. Although some progress has been made, these concerns—both as regards detection of emerging infectious disease threats and communication of alerts regarding such threats—have been underscored by the SARS experience.

Thus, the Committee has recommended that F/P/T governments urgently strengthen surveillance programs. Action would focus first on communicable diseases, and then be extended to non-communicable diseases and relevant population health factors. These surveillance programs must be coupled to short-term investments in support of hospital infection control.

Some legal issues in surveillance also require short-term attention. The *Personal Information Privacy and Electronic Documents Act* [PIPEDA] will come into full force on January 1, 2004. It is not clear if PIPEDA applies to health care providers. To the extent that PIPEDA does apply, its restrictions on the non-consensual use of health information could inadvertently interfere with disease surveillance activities that pose no particular threat to privacy. PIPEDA's application to the health sector accordingly requires an urgent review, culminating in separate federal health information privacy legislation, amendments, or clarifying regulations.

F/P/T collaboration in emergency preparedness and response is more advanced than in health surveillance and outbreak management. This collaboration was triggered by tragic terrorist attacks on the USA in September 2001. Since March 2002, an F/P/T Network for Emergency Preparedness and Response has been working on matters such as leadership and coordination; surge capacity; training and education; surveillance and detection infrastructure (including laboratories); supplies; and communications. We have recommended acceleration of support for the Network's activities with a special focus on communicable disease control.

The Committee sees an urgent requirement for multi-jurisdictional planning to create integrated protocols for outbreak management, followed by training exercises to test the protocols and assure a high degree of preparedness to manage outbreaks. To create surge capacity, the F/P/T Network for Emergency Preparedness and Response has already been working towards establishment of Health Emergency Response Teams [HERT]. The HERT model has been developed as a multidisciplinary group of clinical and support personnel for "all hazards". The SARS experience highlights the need to mobilize selected groups of skilled personnel into epidemic response teams within the HERT framework.

To accelerate collaborative activities in infectious disease surveillance and outbreak management, we have recommended the creation of a new F/P/T Network for Communicable Disease Control. This new F/P/T network would reinforce the collaborative activities of the F/P/T Network for Emergency Preparedness and Response.

The new F/P/T Network for Communicable Disease Control (and the associated funding arrangements) would be Canada's second line of defence against 'the next SARS'. The new F/P/T network would create connections not only among strengthened provincial and regional centres of excellence in infectious disease control. It could also link these P/T nodes or hubs and the relevant centres and laboratories in the new federal agency. As noted, we recommend an approximate target of $100 million per annum in earmarked funding inside the new agency's envelope for transfers to build the required capacity at the P/T level and maintain the new F/P/T network. The flow of federal funds must be tied to intergovernmental agreements and initiatives to secure standardized business processes and a harmonized legislative framework for disease surveillance and outbreak management.

Some federal funding and concerted action to ensure national preparedness should begin as soon as possible given the forthcoming winter season of upper and lower respiratory diseases; specific recommendations for short-term action are included in our report.

As noted earlier, SARS has also raised concerns about the legislative framework for health emergencies management in Canada. Since the Fall of 2001, all jurisdictions have been reviewing and upgrading their emergency planning and preparedness frameworks. However, the F/P/T legislative frameworks for health emergencies have not been analyzed for comparability and interoperability. We have recommended a general intergovernmental review to harmonize F/P/T public health legislation, with specific attention to public health emergencies within extant emergency legislation.

A related concern is lack of clarity about jurisdiction when a health threat affects multiple provinces. The federal *Emergencies Act* (R.S. 1985, c. 22 (4th Supp.)) confers very wide powers on the federal government and can only be invoked in the face of a truly grave national threat. The federal government otherwise has uncertain authority in the face of a multi-provincial outbreak. This situation is particularly problematic as the World Health Organization [WHO] moves to establish International Health Regulations that set expectations for member states as regards surveillance, reporting, and outbreak management. We recommend that consideration be given to a federal health emergencies act to be activated in lockstep with provincial emergency plans in the event of a pan-Canadian health emergency.

Last, the Committee determined that neither Health Canada nor most jurisdictions and institutions have developed sophisticated frameworks for risk communication during a public health crisis. The CDC has a comprehensive crisis communications training program that, in our view, bears close study and early adaptation by Canadian governments and institutions.

Public Health Partnerships Program

While priority must be given in the short term to infectious disease surveillance and outbreak management capacity, the broad range of public health functions also requires support and coordination. In many local health units, the same personnel help fight an outbreak one day and inspect restaurants or deliver a health promotion seminar the next.

We accordingly recommend that a new Public Health Partnerships Program be established under the auspices of the Canadian Agency for Public Health. The new partnerships program would flow funds through specific agreements with P/T public health officials, aimed at reinforcing core public health functions at the local level and collaborative arrangements across jurisdictions. This option is used by the USA and Australia to improve basic public health infrastructure. Funding for programs can be directed at, for example, specific health protection and disease prevention programs, information systems, laboratory capacity, training, recruitment and retention, and emergency response capacity. The programmatic option can be combined with cost-sharing, e.g., some programs could offer a percentage of the cost, up to a defined maximum, with the province or territory finding the balance. Such targeted transfers with associated accountability mechanisms are useful ways to align funding and policy direction. They also reduce the risk that existing spending would simply be displaced.

Spending through the new partnerships program would be increased over several years to a target of $300 million per annum, and aligned with the national public health strategy.

National Immunization Strategy

Since the 1990s, there has been interprovincial diversity in the publicly-funded programs and legislation pertaining to immunization and vaccination. The current arrangements compromise purchasing power, limit the security of vaccine supply, and put providers in the untenable position of having to recommend vaccines to persons/families who cannot afford them.

Four new vaccines are currently unfunded in most P/Ts—conjugate pneumococcal vaccine, conjugate meningococcal vaccine, varicella vaccine and acellular pertussis vaccine. An F/P/T expert group proposed in 2001/02 that the federal government pay for the new vaccines while P/Ts cover the costs of administration. To support their case, those involved produced documentation showing meaningful health and economic benefits from more complete coverage and upgrading of vaccination strategies.

The 2003 federal Budget provided only $45 million over five years ($5 million in year one, and $10 million a year thereafter) "to assist in the pursuit of a national immunization strategy." As noted, the Committee believes that $100 million per annum should be earmarked for a major reinvigoration of the National Immunization Strategy under the auspices of the new Canadian Agency for Public Health. This amount would cover about 50% of the steady-state cost to P/T jurisdictions for purchasing the new vaccines. Some of the funds should also be used to improve tracking systems for vaccination coverage.

Public Health Human Resources

The 2003 federal Budget allotted $90 million over five years for health human resources, but no funds were earmarked specifically for the public health workforce. A clear shortfall in public health human resource planning and development was recognized in the 2001 *Survey of Public Health Capacity in Canada*. The Committee found few definitive data on public health human resources, but those data raised concerns.

Community medicine specialists serve as medical officers of health in local public health agencies, and provide specialized expertise for the provincial and federal governments. Public health physicians are needed in rural areas, the Atlantic provinces, the northern territories, and areas served by Health Canada's First Nations and Inuit Health Branch.

Experts estimate that there are approximately 12,000 public health nurses in Canada. The Canadian Nurses Association estimates that Canada will be short 78,000 registered nurses by 2011. Some experts suggest that Canada is already short 16,000 nurses. Unfortunately, information about the nursing workforce is not collected in a way that makes it possible to extract definitive data on public health nurses.

Medical and PhD-trained microbiologists are in very high demand; current output is too low. There is also a shortage of infection control practitioners [ICP]. ICPs are mostly either nurses (88%) or laboratory technologists (10%) who learn on the job. Forty-two percent of Canadian hospitals fail to meet the current US standard of one ICP per 250 active care beds and 80% cannot attain the new Canadian standard of one ICP per 175 active care beds. Fewer than 60% of Canadian hospitals have a qualified physician serving as infection control director. Canada also needs more epidemiologists with an orientation to field investigation and outbreak response.

In short, on multiple levels, be it staffing for core public health functions or at the interface of clinical and public health activities, there is an acute shortage of highly qualified personnel.

The Committee has recommended that F/P/T governments move expeditiously to develop and implement a national strategy to renew and sustain public health human resources. The strategy should be based on a partnership (after the Australian model) involving governments, academic stakeholders, institutional partners, and professional associations. A budget for this purpose has been built into our projections for new spending by the Canadian Agency for Public Health. The strategy should not only aim at making Canada self-sufficient as regards public health personnel; it should also explicitly aim at enhancing inter-jurisdictional collaboration on a continuing basis.

Public Health Laboratories

Canada's medical laboratories are operated variously by investor-owned corporations, non-profit hospitals and health regions. All provincial governments except New Brunswick operate public health laboratories. Ontario's provincial laboratory could not meet the demands for SARS testing; rapid and impressive steps were therefore taken by laboratory workers in various hospitals in Toronto to establish diagnostic capacity for the coronavirus. Unfortunately, as hospital laboratories took over testing for SARS, the ability to monitor data at the national and even provincial level was undercut because of poor information systems and the lack of data sharing protocols. Linkage of already-limited epidemiologic data to laboratory test results became even more challenging.

This experience underscores our general observation that Canadian laboratory activities in infectious disease testing and outbreak response are not well-coordinated or adequately linked to clinical and epidemiologic data. As recommended in the Lac Tremblant report a decade ago, Canada should initiate an active and collaborative laboratory surveillance system to anticipate, detect and respond to infectious disease threats.

Such a system necessitates better integration of front-line laboratories into the public health system. Steps in that direction have been taken by the Canadian Public Health Laboratory Network [CPHLN]. The CPHLN is coordinated by the directors of the provincial and national laboratories and some federal public health leaders. CPHLN membership should either be extended to major hospital laboratories or these hospitals should be incorporated into provincial networks represented in CPHLN. The Committee's spending projections incorporate additional support for provincial public health laboratories and for the CPHLN to draw in a wider range of laboratory partners. We have also recommended an F/P/T collaborative review of various aspects of the public health laboratory system.

Research

Multiple governments and agencies have now invested millions of dollars into SARS research. For example, the CIHR has taken a lead role in organizing the national SARS Research Consortium. Funding partners in the Consortium include a range of federal and provincial agencies, as well as private sector partners. The Consortium intends to support work in diverse areas, such as diagnostics, vaccine development, therapeutics, epidemiology, databases, public health, and community impact.

However, the immediate research response to SARS was uneven. Research into the cause of SARS, the characterization of the agent, the development of diagnostic tests, and generation of initial clinical descriptions was conducted and communicated relatively rapidly. Research on the immune response with the goal of developing a SARS vaccine has progressed well. Scientists in Vancouver and Winnipeg were among the leaders internationally in sequencing the SARS coronavirus. This success arose from prior collaborative arrangements and capacity. It underscores the importance of support for fundamental research and the need for research networks that are operational in advance of an outbreak.

On the other hand, research on many fundamental epidemiologic and clinical aspects of SARS has lacked cohesion. Scientists in Hong Kong were able to produce seminal epidemiologic and clinical descriptions while responding to a larger epidemic than Canada's. Our incapacity arose in part from previously-identified issues of leadership, coordination, data collection and management, data sharing, and weak mechanisms to link epidemiologic and clinical to laboratory data.

The lack of capacity also reflects training and funding priorities, as well as problems of coordination. The CIHR's submission advised that its investment in infectious disease research "flows primarily to support biomedical research (84%), and the emphasis on biomedical research in this field is stronger than in the CIHR's overall portfolio (72%)." The CIHR is now attempting to build stronger clinical and epidemiologic research capacity in infectious diseases, but has highlighted a lack of coordination among federal and other agencies in developing a research agenda and capacity.

The Committee has recommended that the new Canadian Agency for Public Health and the F/P/T Network for Communicable Disease Control must give special priority to linking research in government and academic institutions with a focus on infectious diseases. It must build in advance the teams and business processes for rapid epidemic or outbreak investigation, and thereby strengthen Canada's ability to respond to the 'next SARS'.

More generally, Australia, the UK, and the USA all have embedded a strong research and science component in their public health activities. A new Canadian agency must therefore combine enhanced intramural R&D capacity with extramural funds that will allow contracting out of R&D functions through partners such as the CIHR. Parallel investments by provinces are also required. Intramural R&D activities at the F/P/T level should be linked to academic health institutions and major municipal health units through co-location, joint venture research institutes, cross appointments, joint recruitment, interchange, networks and collaborative research activities.

Regional and Clinical Issues

During the first wave of SARS in Ontario (SARS I), the government declared a provincial emergency and mandated reductions in elective and ambulatory hospital activity. Outbreak management was overseen by a Provincial Operations Centre. Multiple institutions were involved in caring for SARS patients. During a second wave of SARS (SARS II) from the third week of May to the end of the outbreak in July, the caseload was strategically concentrated in four designated institutions, and outbreak management was overseen by a SARS Operations Centre established within the Ontario Ministry of Health and Long-Term Care.

In Ontario, confusion arose at times as to who was in charge of the outbreak response. GTA hospitals had difficulties implementing some of the directives issued by the provincial government. No Toronto hospital had made infectious diseases a program priority, and there was no regional framework for outbreak management to coordinate responses across institutions or health service sectors. Occupational health and safety issues were a recurrent source of tension within institutions. Family physicians perceived that authorities moved slowly in advising them on precautions to be taken in their offices, or giving them support and supplies. There were no regularized processes for sharing and compensating staff appropriately during an emergency such as SARS. In the public health sphere, informants criticized the lack of coordination across the four involved local units, the weak analytical capacity of the Ontario Public Health Branch and its limited role in supporting or coordinating the outbreak responses.

Respondents later highlighted weaknesses in systems for communicating infectious disease alerts from public health agencies to the operational levels of the health system (i.e., hospitals, long-term and home care facilities, ambulance services, family physicians). The process for issuing alerts was apparently more successful in British Columbia, thanks to the provincial Centre for Disease Control. Post-SARS, clinical and public health leaders in the Toronto area were unambiguous in supporting an integrated and regional system of surveillance, reporting, and outbreak management for infectious diseases.

Physical plant limitations were a particular challenge for hospitals. Only 3.8% and 1.0% of Toronto/GTA acute and non-acute care hospital beds, respectively, are in single, negative pressure rooms. Of 28 Toronto/GTA hospitals with emergency departments, 6 lack infection control areas. About 18% of monitored intermediate/critical care beds in Toronto/GTA are equipped for infection control. Only 30% of hospitals with autopsy suites reported that their facilities conformed to US CDC guidelines. Furthermore, in early March 2003, just prior to SARS, medical bed occupancy in Toronto/GTA averaged 95%.

The impact of provincially-mandated restrictions on hospital activity during SARS I was largest in April, when ambulatory procedure volumes dropped 56% in the GTA hospitals and 70% in Toronto hospitals, compared to April 2002. Levels rebounded in May. The different strategy used in SARS II had a much smaller impact on ambulatory procedure volumes, with the GTA hospitals only 1% below, and Toronto hospitals 5% below the prior year. Urgent and emergency surgery volumes were maintained. Consultants estimated that the volume of deferred elective surgery was over 6,600 inpatient cases and almost 18,000 ambulatory procedures. More than half of the inpatient elective surgery backlog occurred in April 2003 during SARS I. The ambulatory procedure backlog was even more concentrated, with 85% occurring in April.

The Committee's primary focus is on broad F/P/T structures, policies, procedures, and funding. However, given the very long list of issues that emerged from the specific circumstances of the SARS outbreak, we elected to make a limited number of recommendations for the consideration of P/T ministries of health, health regions and hospitals, and provincial and local public health agencies. These recommendations range over matters such as physical facilities in emergency departments and hospitals, regional outbreak management strategies, integrated emergency planning, improved continuing education on infection control, and enhanced linkages between public health and segments of the personal service system (hospitals, home care agencies, primary care).

International Aspects of SARS

SARS has illustrated that we are constantly a short flight away from serious epidemics. Strengthening the capacity of other nations to detect and respond to emerging infectious disease is a global responsibility for a country with Canada's resources and also a matter of enlightened self-interest. The Committee has recommended that the Government of Canada should build health R&D activities into its programs of international outreach. In particular, the new Canadian Agency for Public Health should have a mandate for greater engagement internationally in the emerging infectious disease field, and support projects to build capacity for surveillance and outbreak management in developing countries.

During the SARS epidemic, WHO facilitated collaboration among researchers, promulgated template case definitions, and issued various alerts. WHO established contact with affected countries and offered epidemiologic, laboratory, and clinical support. It also began issuing travel advisories for the first time, acting as a trans-national clearinghouse to assess the safety of international travel and, by extension, the effectiveness of outbreak management efforts in different countries.

In June at the WHO Global Meeting on SARS in Malaysia, it became clear that many countries had adopted their own case definitions for SARS. The Committee believes that further attention is needed to determine the respective roles of a body such as WHO and its member states in defining a new disease such as SARS.

Several Asian jurisdictions faced even greater challenges from SARS than did Canada. Many observers felt that Canadian officials failed to connect closely enough with officials in Hong Kong, Singapore, and China, and missed opportunities to learn from other countries.

Health Canada regularly transmitted information to WHO during the SARS outbreak, but data were limited during the early weeks of the outbreak owing to the absence of formal reporting processes among municipal, provincial, and federal governments. Protocols for data sharing must be established not only for more effective outbreak management, but to ensure that Canada can maintain the confidence of the international community during an outbreak.

Submissions to the Committee from the travel industry indicated significant gaps and inconsistencies with respect to information on SARS available to passengers and staff. The new agency must ensure that there is an effective communication strategy for infectious diseases with contact points for the travel industry.

On April 2, 2003, WHO issued a travel advisory recommending the postponement of all but essential travel to Hong Kong and China's Guangdong province. Previously, only individual countries had issued travel advisories. On April 23, 2003, WHO added Toronto, Beijing, and China's Shanxi province to the list of areas that travellers should avoid. The advice against non-essential travel to Toronto was scheduled to be in place for three weeks before reappraisal, but withdrawn on April 29 after Canadian protests. Controversy about the WHO travel advisory was augmented by inconsistency in categorization of Toronto between WHO and the US CDC, the weak evidence for the travel advisory criteria themselves, and limited warning from WHO of the forthcoming advisory. Assuming that WHO will continue issuing advisories, processes for developing evidence-based criteria and giving notice to affected countries must be developed by agreement among member states.

For many years, Health Canada's Travel Medicine Program has issued advisories to Canadians traveling abroad on risks such as disease outbreaks and natural disasters. Health Canada created its own scoring system to determine travel advice concerning countries affected by SARS, but its evidentiary basis appears no stronger than the contested WHO criteria. Moreover, travel advisories issued by Canada for Hong Kong were at times more severe than the WHO travel advice for Hong Kong. The Committee has therefore recommended that Canada's own practices in issuing travel advisories should be revisited, ideally in the context of a multilateral re-assessment of the basis, nature, goals, and impact of advice to travellers.

In 2002, Health Canada informed airport authorities that it would be transferring airport quarantine responsibilities to the Canada Customs and Revenue Agency. Customs staff were never trained to do the job. During the SARS outbreak, Health Canada amended the *Quarantine Act* Regulations to include SARS but only a tiny contingent of quarantine officers was on hand to enforce the new regulations. Airport authorities expressed concern about Health Canada's ability to mobilize knowledgeable quarantine staff to the airports, to provide logistical support, and to manage the relevant communications. In the case of cruise ships, Health Canada's protocols for screening, handling of suspected SARS cases, and decontaminating ships were not released until mid-June, after the outbreak had waned. The Committee has recommended that the Government of Canada ensure that an adequate complement of quarantine officers is maintained at all ports of entry, and that better collaboration with port authorities and personnel be established to clarify responsibilities in the event of a health threat.

Screening of incoming and outbound air passengers relied on information cards with screening questions and secondary assessments as needed, as well as a pilot project using thermal scanners in Toronto and Vancouver. As of August 27, 2003, an estimated 6.5 million screening transactions had occurred at Canadian airports to aid in the detection and prevention of SARS transmission. Roughly 9,100 passengers were referred for further assessment by screening nurses or quarantine officers. None had SARS. The pilot thermal scanner project screened about 2.4 million passengers. Only 832 required further assessment, and again none were found to have SARS. In other countries, the yields for airport screening measures were similarly low.

We have accordingly recommended that the Government of Canada should review its travel screening techniques and protocols with a view to ensuring that travel screening measures are based on evidence for public health effectiveness, while taking into account the financial and human resources required. While formal screening thus far appears relatively inefficient and ineffective, the Committee has recommended that the Government of Canada provide travelers in general with information about where and when health threats exist, including precautionary measures and first steps to take in case of suspected infection. A partnership with the travel industry would facilitate this process so that information could be provided at the time of bookings.

Conclusion

Long before SARS, evidence of actual and potential harm to the health of Canadians from weaknesses in public health infrastructure had been mounting but had not catalyzed a comprehensive and multi-level governmental response. SARS killed 44 Canadians, caused illness in hundreds more, paralyzed a major segment of Ontario's health care system for weeks, and saw in excess of 25,000 residents of the GTA placed in quarantine. Psychosocial effects of SARS on health care workers, patients, and families are still being assessed. However, the economic shocks have already been felt not only in the GTA, the epicenter of SARS, but across the country.

The National Advisory Committee on SARS and Public Health has found that there was much to learn from the outbreak of SARS in Canada—in large part because too many earlier lessons were ignored.

A key requirement for dealing successfully with future public health crises is a truly collaborative framework and ethos among different levels of government. The rules and norms for a seamless public health system must be sorted out with a shared commitment to protecting and promoting the health of Canadians. Systems-based thinking and coordination of activity in a carefully-planned infrastructure are integral in public health because of its population-wide and preventive focus. They are also essential if we are to be effective in managing public health emergencies. Indeed, Canada's ability to contain an outbreak is only as strong as the weakest jurisdiction in the chain of P/T public health systems. Infectious diseases are an essential piece of the public health puzzle, but cannot be addressed in isolation, particularly since in local health units, the same personnel tend to respond to both infectious and non-infectious threats to community health. The Committee has accordingly recommended strategies that will reinforce all levels of the public health system as well as integrate the components more fully with each other.

The fiscal and strategic approaches set out in this report are consistent with international precedents and, we believe, the expectations of Canadians. Until now, there have been no federal transfers earmarked for local and P/T public health activities. Public health has instead been competing against personal health services for health dollars in provincial budgets, even as the federal government has increasingly earmarked its health transfers for personal health service priorities. Public health costs are modest—perhaps 2-3% of health spending, depending on how one defines numerators and denominators. The actual amount of new federal spending that the Committee has recommended would reach $700 million per annum by 2007 at the earliest. This is what F/P/T governments currently spend on personal health services in Canada between Monday and Wednesday in a single week.

The SARS story as it unfolded in Canada had both tragic and heroic elements. Although the toll of the epidemic was substantial, thousands in the health field rose to the occasion and ultimately contained the SARS outbreak in this country, notwithstanding systems and resources that were manifestly suboptimal. The challenge now is to ensure not only that we are better prepared for the next epidemic, but that public health in Canada is broadly renewed so as to protect and promote the health of all our present and future citizens.

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Ian Green, Deputy Minister, Health Canada and Scott Broughton, Assistant Deputy Minister, Population and Public Health Branch, gave the Committee Chair unfettered access to Health Canada officials and staff outside of their normal reporting structures.

Many individuals in the Population and Public Health and Health Policy and Communications Branches of Health Canada provided background information and support critical to the development of the Committee's final report.

Among those who made direct contributions were: Ian Shugart, Assistant Deputy Minister, Health Policy and Communications Branch; Dr. David Mowat, Director General, Centre for Surveillance Coordination; Dr. Paul Gully, Senior Director General, Population and Public Health Branch; Dr. Ron St John, Director General, Emergency Preparedness and Response; Dr. Judith Shamian, Executive Director, Nursing Policy Office; Dr. Arlene King, Director, Immunization and Respiratory Diseases Division; Dr. Ping Yan, Chief, Centre for Infectious Disease Prevention and Control; Dr. Theresa Tam, Medical Specialist; and Claude Giroux, Senior Policy Advisor.

This senior group of Health Canada employees made themselves available for interviews and prepared background materials that were very helpful to the Committee. All were supported by large teams; some also drew on stakeholders for input and advice. Both these senior personnel and the Committee wish to thank all their team members and the stakeholders who assisted them in supporting the Committee's deliberations.

Also from Health Canada, Edith Morber, Senior Policy Advisor, greatly facilitated the Committee's work with her editorial and synthetic skills and secretariat support. Sylvie Ladouceur and Carole Morris provided logistical support and ensured that Committee meetings ran smoothly.

While the Committee is indebted to these and other individuals in Health Canada for their assistance and input, we have drawn our own conclusions, as will be plain from some critical assessments of Health Canada's actions, policies, and preparedness for SARS.

Independent consultants played a key role in the Committee's work. Saira David served as a policy and research advisor to the Committee, providing valuable input. Prof. Sujit Choudhry of the University of Toronto Faculty of Law consulted extensively to the Committee on some thorny constitutional and policy issues. We have incorporated his work into the report with permission, although it should not be assumed that Prof. Choudhry endorses or agrees with all the recommendations and conclusions drawn by the Committee. The Hay Group in Toronto undertook a major consultancy on local/regional clinical and public health issues. Again, we have incorporated their outstanding work into the report, but the Committee takes full responsibility for the findings and recommendations.

Drs. Irfan Dhalla and Jeff Kwong, post-graduate specialty residents in, respectively, Medicine and Community Medicine at the University of Toronto, served as tireless research and editorial associates. They made a major contribution to the Committee's work, somehow balancing these demands with the exigencies of residency training.

The Committee is particularly appreciative of the front-line health care and public health professionals and administrators who took time out of their busy schedules to discuss their first-hand experiences combating and containing SARS, and their views on the lessons learned. We have generally referenced their comments without attribution. A few interviewees requested complete anonymity; the names of other interviewees are listed in an appendix to the report. The Committee extends its sincere thanks to them all.

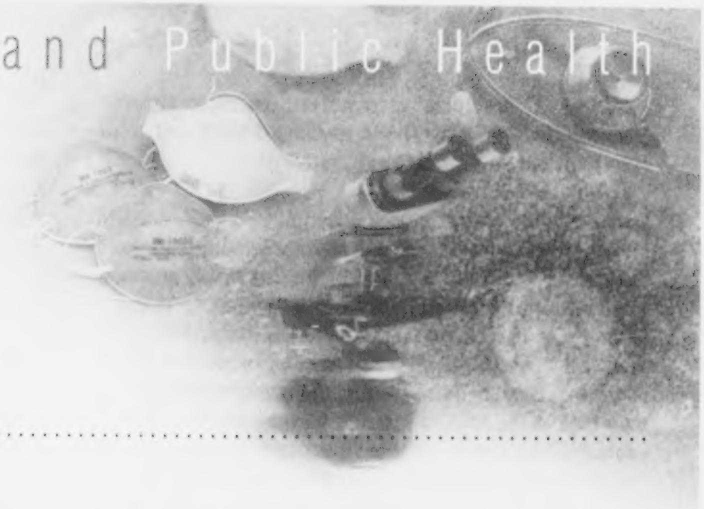
This report would not have been possible without the many excellent submissions received by the Committee from various non-governmental and private sector organizations. Not every stakeholder group will find all its comments or recommendations directly referenced in the report. Similarly, to keep the number of recommendations to a manageable and prioritized list, not every suggestion from the submissions has been transformed into a Committee recommendation. However, the Committee can warrant that all submissions had an influence on our deliberations and recommendations. With a few exceptions, stakeholders kindly agreed to have their submissions posted electronically for internet access (see www.sars.gc.ca). We urge interested readers to access the important ideas and recommendations of these stakeholders; various of their briefs address issues that could not be covered in this report, and all the briefs serve as valuable resources for further study and action. These individuals and organizations share fully in credit for any meritorious aspects to the report. The Committee accepts responsibility for errors or omissions.

Dr. Julie Gerberding, Director of the US Centers for Disease Control [CDC], agreed to participate as a corresponding member and facilitated our access to information about the CDC's operations. On her behalf, Dr. Marty Cetron attended a Committee meeting and helped us understand aspects of the CDC's perspectives on SARS. Dr. David Heymann had also agreed to participate as Executive Director of Communicable Diseases for the World Health Organization; but was reassigned in July 2003 by the new WHO Director-General, Dr. Lee Jong-wook, to be his Representative for Polio Eradication.

Last, the Committee was mandated to produce an account of key lessons learned from the outbreak of SARS in Canada, particularly as regards measures that must be taken to enhance the public health systems of our nation. We are grateful for the mandate given our members by the Government of Canada and the Hon. Anne McLellan, Minister of Health, and hopeful that prompt action will be taken by all levels of government, as well as relevant institutions and stakeholders, to ensure that the health of Canadians is protected and promoted even more effectively in the years ahead.

Chapter 1

SARS and Public Health



INTRODUCTION

Severe Acute Respiratory Syndrome, now known worldwide by the acronym SARS, is considered to be the "first severe and readily transmissible new disease to emerge in the twenty-first century".[1]

In late February, several guests at the Metropole Hotel in Hong Kong had come in contact with an ill doctor who had been involved in treating patients with an atypical form of pneumonia in Guangdong, China. Those guests continued their travels in Hong Kong and on to Canada, Singapore, and Vietnam. They fell ill, and began spreading the disease to others. Many of them died. This illness was soon identified as severe acute respiratory syndrome or SARS. As of July 11, 2003 in its daily summary, the World Health Organization [WHO] reported 8,437 probable cases of SARS and 813 deaths worldwide, and the toll has since risen to about 900 as some previously-ill individuals have succumbed.

Canada, like other countries, faced an intense battle to control SARS. Public health and health care personnel worked tirelessly to contain the outbreak within systems that were often seriously inadequate to the task. Citizens were also impressively calm and cooperative, notwithstanding innumerable disruptions to their working lives and quarantine requirements that affected thousands.

SARS was and remains a challenge to diagnose and manage because its symptoms resemble those of many other respiratory infections. Thus far, extensive research by a WHO-coordinated international network of research centres has identified a novel coronavirus as the presumed cause of SARS. The diagnostic tests available to test for the SARS coronavirus have limitations with respect to their reliability and sensitivity, and more research is needed to enable the rapid identification and characterization of this new coronavirus.[2]

SARS is spread through close contact with an individual who has SARS. The disease has an incubation period that typically ranges from 2 to 10 days. Affected individuals experience fever (>38°C) and later develop respiratory symptoms such as cough, shortness of breath, or difficulty breathing. Overall, case fatality from progressive respiratory failure ranges from less than 1% of cases for persons under 24 years of age to 15% of cases for persons aged 45 to 64 years of age; in persons over the age of 65, the fatality rate can exceed 50%.[3] Diagnosis rests partly on the clinical syndrome, partly on a link to known cases of SARS, and partly on a process of exclusion. The virus can be isolated from respiratory secretions and stool; however, it is not always detected from these sources even in patients with probable SARS. Serological tests based on the body's immune response to SARS are also helpful, but these tests do not begin to yield useful information until a few weeks after the onset of symptoms. No vaccine or cure currently exists leaving clinicians to rely primarily on supportive measures and public health authorities to rely on isolation and quarantine as the predominant measures to control SARS.

Emerging and Re-emerging Infectious Diseases

Emerging infectious diseases are diseases that are newly identified, or that have existed previously but are increasing in incidence or geographic range.[4] SARS is the most recent example of a new or otherwise unknown disease. Variant Creutzfeldt-Jakob disease, discovered in 1996 and considered to be the same agent as that causing bovine spongiform encephalitis in cattle, is another example. Since 1973, more than 30 previously unknown diseases associated with viruses and bacteria have emerged. Examples include: Ebola virus (1977); Legionnaire's disease (1977);

E. coli 0157:H7-associated hemolytic uremic syndrome (1982); HIV/AIDS (1983); Hepatitis C (1989); and H5N1 Influenza A or avian flu (1997).[5]

West Nile virus infection is an example of a previously known disease that has increased its geographic range. The discovery of West Nile virus in the USA in 1999 marked the first introduction in recent history of an Old World flavivirus into the New World.[6] West Nile virus was discovered in the West Nile district of Uganda in 1937. In the last decade, human outbreaks of West Nile have increased in the Middle East and Europe, suggesting the evolution of a new West Nile virus variant.[7] West Nile virus arrived in Canada in 2001, found in dead birds and mosquito pools in Ontario. The first human cases of infection occurred in 2002. In 2002, West Nile virus was found in five provinces: Nova Scotia, Quebec, Ontario, Manitoba, and Saskatchewan, with Quebec and Ontario having confirmed cases of human infection.[8] On August 12, 2003, Alberta reported its first case of West Nile virus, a young woman who likely contracted the disease while camping in Southern Alberta.[9] Federal and provincial governments all have action plans to reduce the spread of the virus.

Re-emerging infectious diseases are known diseases previously considered under control and no longer considered a public health problem, but that have reappeared or are causing an increased number of infections.[10] Some examples include: the reappearance of epidemic cholera in the Americas in 1991; dengue fever in the Americas in the 1990s; diphtheria in the Russian Federation and other republics of the former Soviet Union in 1994; the increase in the occurrence of meningococcal meningitis in Sub-Saharan Africa since the mid-1990s; and Yellow fever in Africa and South America since the mid-1980s. Tuberculosis may be considered in this category in some respects. Tuberculosis has remained a public health problem for vulnerable populations. Its toll has increased with urban crowding and poverty in developing and developed nations, with the advent of the HIV pandemic, and with the emergence of strains of drug-resistant tuberculosis bacteria.

Many of the pathogens believed to cause infectious diseases are already present in the environment. Activities that increase microbial traffic between people and their environments promote emergence and epidemics.[11] Among the factors precipitating the emergence and re-emergence of infectious diseases are: ecological changes (including those due to economic development and land use); human demographics and behaviour; technology and industry; and microbial adaptation and change.

HIV provides a good example of how such factors have led to the emergence of infectious diseases. HIV is believed to have had a zoonotic origin. Ecological factors such as deforestation and land development would have increased human exposure to the animal host. Social events such as population growth and migration played a role in increasing the opportunity for HIV transmission to other humans. Sexual behaviour, use of illicit drugs by injection, and iatrogenic causes (e.g., the early spread of HIV through blood transfusions and blood products) provided added advantages for the continued and accelerated transmission of HIV.[12] Bovine spongiform encephalopathy and hemolytic uremic syndrome caused by *E. coli* 0157:H7 (commonly known as hamburger sickness) are examples of diseases that emerged as a result of changes in food production.[13]

Factors that exacerbate the emergence and re-emergence of infectious diseases, and that present challenges in dealing with outbreaks, are globalization and deficiencies in public health infrastructure.

Globalization and Communicable Disease

Globalization has made our world smaller as people and goods move more freely and more frequently around the globe. As the world becomes more interconnected, the opportunities for rapid and effective disease spread increase. And as was seen with SARS, travel plays a pivotal role in the rapid dissemination of disease. According to World Tourism Organization data[14], approximately 715 million international tourist arrivals were registered at borders in 2002 (preliminary data). Human migration has been a key means for infectious disease transmission throughout recorded history. However, the volume, speed, and reach of travel today have accelerated the spread of infectious diseases.[15] The rapidity of movement from one country to another or one continent to another falls well within the incubation period of virtually all infectious diseases. Disease emergence is nonetheless complex, and the conditions for a disease-causing organism must be right in order for it to survive, proliferate, and find a way to enter a susceptible host.[16] SARS, thought to be spread through droplet nuclei and close physical contact, proved to be a disease easily carried to any part of the world.

The globalization of the food (and feed) trade, while offering many benefits and opportunities, also presents new risks. Because food production, manufacturing, and marketing are now global, infectious agents can be disseminated from the original point of processing and packaging to locations thousands of miles away.[17]

Emerging and re-emerging infectious diseases are a permanent fixture on the public health landscape at the local, regional, national, and international levels. People will continue to travel and migrate; goods will continue to be traded. In order to mitigate the incidence and effects of infectious diseases, therefore, communication at all levels and local responses to infectious diseases must be enhanced.

Compounding the challenges of dealing with emerging and re-emerging infectious diseases is the threat of the accidental or intentional release of biological agents. The events of September 11, 2001 and the intentional release of anthrax spores that immediately followed in the USA, make the possibility of the accidental or intentional release of a biological agent a disturbing reality and a threat to global security. International cooperation has been required to prepare for such events.

Working collaboratively with international bodies is also a key component to dealing effectively with infectious diseases. Canada is in regular contact with the World Health Organization [WHO] and the US Centers for Disease Control and Prevention [CDC] in its day-to-day business of conducting disease surveillance.

The World Health Organization [WHO]

WHO is the United Nations' specialized agency for health whose objective is the "attainment by all peoples of the highest possible level of health." In 2001, the World Health Assembly, made up of 192 member states, adopted a resolution on "Global health security: Epidemic alert and response," in recognition of the threats to public health posed by epidemic-prone and emerging infections, and bioterrorism. That resolution expressed support for ongoing work on the revision of the International Health Regulations, the development of a global strategy for infectious disease containment and the prevention of antimicrobial resistance, and collaboration between WHO and technical partners in the area of epidemic alert and response. It also urged members to participate actively in surveillance activities related to health emergencies of international concern, to develop and update national preparation and response plans, to develop training for involved staff, and to ensure availability of contemporary information on surveillance and control of infectious diseases.

Within WHO, the Department of Communicable Disease Surveillance and Response [CSR] is responsible for realizing this mandate. It envisages that "every country should be able to detect, verify rapidly and respond appropriately to epidemic-prone and emerging disease threats when they arise to minimize their impact on the health and economy of the world's population."

The CSR's three strategic directions are to contain known risks, respond to the unexpected, and improve preparedness. Activities include tracking emerging infectious diseases, sounding an alarm when necessary, sharing information on emerging diseases and disease outbreaks, and providing assistance to affected states in the form of technical assistance, supplies, and in some cases, international investigations/responses.

WHO emphasizes that global surveillance and strong public health systems are needed to respond to emerging and re-emerging infectious diseases, and possible bioterrorism events. As mentioned earlier, WHO is currently revising its International Health Regulations which set out to "ensure the maximum security against the international spread of diseases with minimum interference with world traffic." From WHO's perspective, the worldwide SARS outbreak has underscored the need for these revised regulations.[18]

US Centers for Disease Control and Prevention [CDC]

The CDC is the lead federal agency in the USA for protecting the health and safety of its citizens, and is part of the Department of Health and Human Services. It serves as the national focus for developing and applying disease prevention and control, environmental health, and health promotion and education activities with respect to health. CDC was originally established as the US 'Communicable Diseases Center' after the Second World War. The continuation of the acronym CDC (minus the P for prevention) and public image of the agency as an outbreak-fighting organization both tend to mask the extent to which CDC now serves broad public health functions in the USA. The agency employs approximately 8,500 employees working in 170 occupations in various locations, including in CDC facilities around the USA, in other countries, in quarantine offices, and in state and local health agencies. It is made up of 12 centres, institutes and offices, one of which is the National Center for Infectious Diseases [NCID].

The NCID's mandate is "to prevent illness, disability, and death caused by infectious diseases in the United States and around the world." It accomplishes this by conducting surveillance, epidemic investigations, epidemiologic and laboratory research, training, and public education programs to develop, evaluate, and promote prevention and control strategies for infectious diseases. NCID staff work in partnership with local and state public health officials, other federal agencies, medical and public health professional associations, infectious disease experts from academic and clinical practice, and international and public service organizations. The NCID also works closely with other Centers within the CDC such as the Public Health Practice Program Office, the Office of Global Health, and the Epidemiology Program Office among others.

Like many other countries, the USA is in the process of improving its national capacities for disease surveillance, prevention, and control. It has developed a strategic plan for preventing emerging infectious diseases, the pillars of which are surveillance and response, applied research, infrastructure and training, and prevention and control. The CDC seeks to improve epidemiologic capacity, surge capacity, communications, and the supply of appropriate and adequate equipment and training.[19]

A "CDC North"?

The experience of the SARS outbreak has renewed calls for a Canadian version of the US Centers for Disease Control and Prevention to improve coordination of public health across Canada, champion public health initiatives nationally, and direct the operations of a national disease control body. These calls are based on the premise that public health threats such as SARS are national issues that need a coordinated response from both public health and emergency response systems, with appropriate support at the federal level. They are also based on the limitations in response capacity as well as issues with coordination and communication that were highlighted during the battle to control SARS in Canada. The National Advisory Committee on SARS and Public Health has taken a key part of its mandate to be the assessment of options for enhancing our response capacity to health crises, particularly outbreaks of emerging infectious diseases such as SARS.

Emergency Preparedness

The terrorist attacks of September 11, 2001 in the USA underscored the necessity of local, regional, and national preparedness for any emergency. New York City [NYC] saw the benefits of forward planning when a case of exposure to anthrax, found on October 9, 2001, was successfully handled. NYC was in the process of developing protocols for mass antibiotic prophylaxis against anthrax in 1999, and had also established an incident command structure of which NYC government agencies are part. This command structure includes the following components: clinical response, sheltering, surveillance, environmental health, laboratory, communications, management information systems, and physical plant operations. Each component is operated by staff from a variety of the city's Department of Health programs. NYC's command system swung into high gear the moment the anthrax exposure case was identified. An antibiotic distribution site was established, and work began on administering antibiotics and determining the source of the anthrax and who might have been exposed.

The success of this operation was attributed to four "C's", i.e., *clarity* of mission, lines of authority, and responsibilities; *communication; collaboration* among federal, state and local public health officials, and law enforcement officials; and *coordination* of staffing and supplies.[20]

Federal/provincial/territorial Ministries of Health have made progress in their emergency preparedness and responses plans since September 11, 2001, and are working collaboratively towards a seamless pan-Canadian health emergency management system. However, the SARS outbreak demonstrated that more needs to be done to integrate the public health and emergency response systems in times of crisis. We cannot say, with confidence, that the factors that contributed to NYC's successful handling of its anthrax incident were in place to handle Canada's SARS outbreak.

The State of Canada's Public Health System

The public health system, unlike the clinical or personal health services system, tends to operate in the background, little known to most Canadians unless there is an unexpected outbreak of disease. However, the public health system has many essential roles. These include health protection, disease and injury prevention, and health promotion, along with time-honoured fundamentals such as access to safe foods, safe drinking water, and proper sanitation systems. An effective public health system is essential to preserve and enhance the health status of Canadians, to reduce health disparities, and to reduce the costs of curative health services. While public health activities may evolve as a result of changing technology and needs, the goals remain the same: to reduce the amount of disease, premature death, and pain and suffering in the population.

Public health has the health of populations as its priority. The population approach recognizes that the health of populations and individuals is shaped by a wide range of factors in the social, economic, natural, built, and political environments. In turn, these factors interact in complex ways with each other and with innate individual traits such as sex and genetics. Such a broad perspective on health takes into account the potential effects of social connectedness, economic inequality, social norms, and public policies on health-related behaviours and on health status.

The Walkerton, Ontario *E. coli* outbreak in May 2000 and the North Battleford, Saskatchewan outbreak of *Cryptosporidium parvum* in April 2001 demonstrate how breakdowns in infrastructure lead to public health crises. A recent comparative study of the Walkerton and North Battleford outbreaks conducted by Woo and Vicente concludes that both accidents resulted from a complex interaction among factors at multiple levels ranging from inadequate supervision, compliancy failure, and complacency on the part of regulatory bodies, to provincial budget cutbacks.[21]

A more cohesive, comprehensive approach to public health must form the basis for a sustainable public health system. This means cooperation not only across governments but also within governments, and involves the private sector, non-governmental organizations, and the public. This is no easy task.

Federal/Provincial/Territorial Structures and Linkages

Canada's Constitution provides both the federal and provincial/territorial governments with elements of legislative authority over health. The primary federal acts governing public health and infectious diseases are the *Department of Health Act* which provides powers related to disease surveillance and the "protection of the people of Canada against the risks to health and the spreading of diseases" and the *Quarantine Act*. Provincial and territorial governments have regulations with respect to reportable diseases requiring special attention and measures. All jurisdictions have legislation governing emergencies which generally cover infectious disease epidemics and other situations that would present a serious public health threat.

The federal government supports health care through the Canada Health and Social Transfer [CHST] which provides provinces and territories with cash payments and tax transfers to apply as they see fit to their health and social programs. From time to time, the federal government also provides funding for specific health initiatives, most recently primary or home care. Provincial and territorial governments provide funding to their respective health authorities predominantly through grants. In Ontario, municipalities share a 50% responsibility for the funding of most local public health programs. In 2002, approximately $79.354 billion was spent on health by the federal, provincial, territorial, and municipal governments. There is no standardized definition of public health, and it is therefore difficult to obtain a precise estimate of what is spent on public health. However, in rough terms, spending on personal health services is about thirty-fold greater than public health spending.

Only weak mechanisms exist in public health for collaborative decision making or systematic data sharing across governments. Furthermore, governments have not adequately sorted out their roles and responsibilities during a national health crisis. Each level of government, from local to federal must collaborate if Canada is to achieve a seamless, integrated approach to public health and to managing health crises. The SARS outbreak has highlighted many areas where inter-jurisdictional collaboration is suboptimal; so far from being seamless, the public health system showed a number of serious gaps.

Canada's SARS Experience

After China and Hong Kong, Toronto was the region hardest hit by SARS. As of August 12, 2003, there had been 438 probable and suspect SARS cases in Canada, including 44 deaths. The majority of SARS cases have been concentrated in Ontario and all deaths have occurred in Toronto. The toll on health care workers has been especially high: more than 100 fell ill with probable SARS and three succumbed.

SARS placed heavy pressures on Toronto's public health and health care system. The region's health care professionals, as front-line workers vital to controlling the disease, were at heightened risk for contracting the disease, and under considerable physical and psychological stress. Many patients required intensive care, hospitals had to close, elective procedures were cancelled, and procuring adequate types and quantities of supplies to combat the disease was difficult. SARS also placed unprecedented demands on the public health system, challenging regional capacity for outbreak containment, surveillance, information management, and infection control.

While the public health and health care workers involved did an admirable job of containing SARS and keeping it from spreading to the larger community, the SARS experience highlighted weaknesses in Canada's public health system. Many issues to do with the clinical system and clinical/public health interface were also thrown into high relief. Aside from the lack of surge capacity to deal with this crisis situation, problems emerged with respect to timely access to laboratory results, information sharing, data ownership, and epidemiologic investigation of the outbreak. Communication to the public was sometimes inconsistent, and it was not always clear who was in charge of the outbreak response.

The SARS experience illustrated that Canada is not adequately prepared to deal with a true pandemic. The Ontario government has similarly emphasized that Ontario's public health system could not have withstood two simultaneous large-scale outbreaks or crises such as SARS.[22] It is unlikely that most other provinces are in a better position, and the federal capacity to support one or more provinces facing simultaneous health crises is limited.

Having the SARS outbreaks occur in Canada's largest city presented many challenges. However, it may have been fortuitous that SARS struck Toronto and not a less-advantaged region of the country. Few rural and small urban hospitals have resident specialists in infectious disease; infection control officers/nurses are often part-time, and include infection control among a number of somewhat unrelated functions such as nursing supervision or occupational health. In smaller jurisdictions, communicable disease investigation and control falls to public health nurses and inspectors with at most one physician, who may or may not be fully trained in public health, to provide back-up and oversight. Multi-tasking across a wide range of activities from well baby and immunization to community development is the rule in rural public health units, with very limited specialization of functions. How can we strengthen the public health system to ensure that it can meet the unique challenges of both major metropolitan areas and smaller or rural communities?

Learning from SARS

The lessons learned from SARS are critical pieces of information for determining the improvements needed in Canada's public health system. Enhancement of surveillance mechanisms, better coordination among the various levels of government and institutions for outbreak containment, improved public communications strategies, and major increases in expert human resources are just some of the changes needed if Canada is to be better prepared for future health crises.

SARS resulted in a tragic loss of life, grieving families and friends, tremendous dislocation to the health system, and economic turmoil. Fortunately, SARS was only moderately contagious and did not turn into a full-blown pandemic. In Canada, the outbreak was primarily centred in a major urban area with unparalleled health care resources. Nonetheless, it severely tested local, federal, and provincial capacity to deal with the outbreak, illuminating the strengths and deficiencies of the existing public health and health care systems. The knowledge gained from battling SARS should help Canada put in place a public health system that will be capable of not only dealing with the next outbreak, but the next pandemic.

There is no time for complacency. SARS has been subdued, perhaps only temporarily, and the fall season of respiratory illnesses will soon be upon Canada. The work to improve the public health system and prepare the clinical services system must begin apace.

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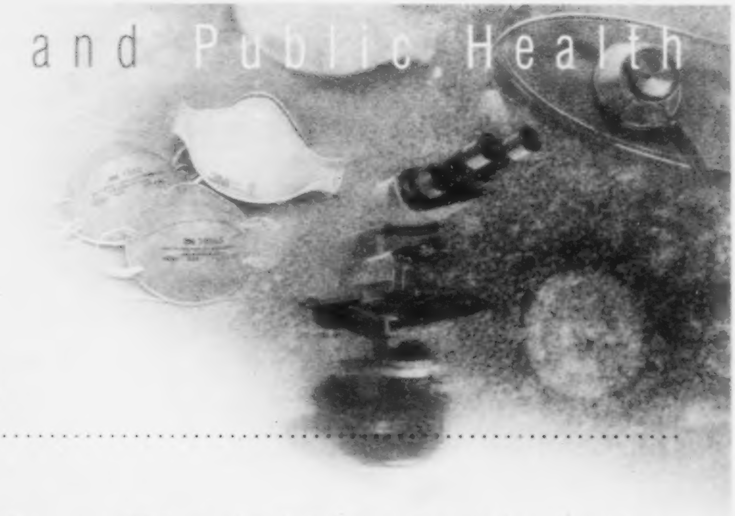
Chapter 2



SARS IN CANADA: Anatomy of an Outbreak

Through the ages humans have relied on animals for food, labour, companionship, and entertainment. However, our interactions with animals have infected humans with numerous communicable diseases. It now appears that exotic animals in a Guangdong market—perhaps civet cats or raccoon dogs—may have given the human race yet another novel infectious disease: severe acute respiratory syndrome, or SARS.

Old diseases usually spread slowly. Smallpox, for example, was a scourge in Europe for thousands of years before it finally crossed the Atlantic with Christopher Columbus and his men. SARS, on the other hand, moved at the speed of a jet airplane. Within days of its arrival in Hong Kong, it had circled the globe.

This chapter provides a brief overview of the SARS outbreak in Canada. The SARS story is one in which thousands of front-line public health and health care workers rose brilliantly and often heroically to the occasion to contain an outbreak, despite systems that were often seriously inadequate to the task. We found, not surprisingly, that individual and organizational perspectives on the same events during the outbreak often differed sharply. Further, although new information continuously emerged, it increasingly had more to do with retrospective second-guessing of decisions by individuals than with forward-looking enhancements to the public health and health care systems. This truncated account is designed simply to remind Canadians of how the SARS outbreak unfolded, and touches on some key issues that surface from even a cursory review of four extraordinary months in the history of Canadian public health and health care.

We have minimized the use of names throughout the account for participants and interviewees. Other reviews underway, particularly the Ontario Public Health Investigation by Mr. Justice Archie Campbell, have the time and mandate to dissect specific events in detail. Most of the salient issues are adequately framed by the first wave of SARS in Canada, and the account focuses more on "SARS I", recognizing that Mr. Justice Campbell's mandate arose in meaningful measure from events around the second wave or "SARS II". Nonetheless, we do track the outbreak through to containment in June 2003. Future historians will be able to describe these events with greater accuracy, a wider international perspective, and the benefit of longer hindsight.

2A. A New Disease in Guangdong
(November 27, 2002 - February 22, 2003)

> *"Have you heard of an epidemic in Guangzhou? An acquaintance of mine from a teachers' [Internet] chat room lives there and reports that the hospitals there have been closed and people are dying."*
>
> *—Dr. Stephen Cunnion (posted on ProMED-mail on February 10, 2003)*

On February 14, 2003, the World Health Organization [WHO] reported in its weekly newsletter that an unusual acute respiratory illness had claimed five lives since the previous November in Guangdong Province, China. Three hundred more people—about one-third of them health care workers—were reported to have been infected. Six days later, the Chinese Ministry of Health informed the WHO that the cause of the illness was a common bacterium, *Chlamydia pneumoniae*.[1]

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[1] *Chlamydia pneumoniae* is an obligate intracellular bacterium—it depends on and lives within a host cell. Most adults will be infected by *C. pneumoniae* at some point in their lives. Infections result in respiratory illness of varying severity, and can be effectively treated with widely available antibiotics.

More than two months before, Health Canada's Global Public Health Intelligence Network [GPHIN] received a Chinese-language news report of a flu outbreak in mainland China. GPHIN is an early-warning system that continuously scans Internet media sources for reports of infectious disease outbreaks around the world. The Chinese report, published on November 27, 2002, was sent to WHO with an English header. The full report was never translated. Health Canada officials became aware of the new disease along with the rest of the world in February 2003.

Health Canada publicized the Guangdong outbreak in its next FluWatch bulletin,[2] which summarized influenza activity between February 9 and 15, 2003. The following week, FluWatch reported that Chinese authorities claimed the Guangdong outbreak was over.

Concurrently, officials in Hong Kong reported a case of avian influenza. On February 19, 2003, during a regular conference call with Health Canada's Pandemic Influenza Committee, federal officials recommended that all provinces be vigilant for influenza-like illnesses in returning travellers, particularly those returning from Hong Kong or China. Health Canada also issued written alerts on February 20 and 21 to the Pandemic Influenza Committee, the Council of the Chief Medical Officers of Health, the Canadian Public Health Laboratory Network, the FluWatch network (including hospital infection control practitioners), and veterinarians, warning all recipients to be alert for avian flu. Some representatives on the Pandemic Influenza Committee expressed concerns that Health Canada should not be dealing directly with hospital infection control practitioners.

Around this time, ProMED-mail, an Internet-based reporting system that, like GPHIN, provides early warnings of infectious disease outbreaks, was alerting its audience that the mysterious respiratory ailment in Guangdong might not be caused by *Chlamydia pneumoniae* after all—tests found the bacteria in only two of the deceased patients' tissue samples.

The combination of the two outbreaks—avian flu and the mystery disease—raised concern among staff at the British Columbia Centre for Disease Control, and its officials issued the first of three broadcast e-mails on February 20, informing doctors, infection control specialists, and public health authorities to be alert for influenza-like symptoms in travellers returning from China. Toronto public health officials sent out similar information about severe 'flu' in younger adults to a list of infectious disease and emergency room physicians in Toronto on February 20, and the Provincial Public Health Branch circularized health units to the same effect on February 21.

Meanwhile, the chain of events that would bring SARS to Canada began. A 65-year-old doctor who had treated atypical pneumonia patients in Guangdong travelled to Hong Kong to attend his nephew's wedding. By the time he checked into the Metropole Hotel, he was feeling unwell. The doctor infected at least 12 other guests and visitors from several countries, including a 78-year-old woman from Canada, Mrs. K S-C.

DISCUSSION POINT

The Canadian Hospital Epidemiology Committee advised the Committee that Canada lacks a coordinated system to "notify acute care facilities of a global health alert, with attendant recommendations for surveillance and control" if persons suspected of having a new infectious disease "appear in Canadian health care facilities." Relevant information was sent out in Ontario, but the lines of accountability for alerts appear blurred, and key target groups commented that they had no prior warning of a new respiratory virus from Asia. Does Canada have an adequate system to detect emerging diseases worldwide or even within its borders? Once an outbreak is detected, what kind of communication structure would work best to get information to public health officials, infection control specialists, emergency departments and ultimately to front-line health care workers—and ensure that appropriate responses are occurring?

2B. From Kowloon to Scarborough
(February 23, 2003 - March 12, 2003)

Mrs. K returned to Toronto on February 23, 2003 after a 10-day trip to Hong Kong. During her holiday, she spent three nights at the Metropole Hotel in Kowloon where she briefly encountered the Guangdong doctor. Two days after arriving in Toronto, Mrs. K developed a high fever, and by the time she visited her family doctor on

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[2] FluWatch reports are posted on Health Canada's website weekly during the influenza season (September to April) and biweekly during the rest of the year. Prior to Internet publication, Health Canada sends the reports by e-mail or fax to provincial and territorial FluWatch representatives, the Pandemic Influenza Committee, a 250-doctor strong network of sentinel physicians, the College of Family Physicians of Canada, hospital infection control practitioners, WHO and the Pan-American Health Organization [PAHO], the CDC and several federal government departments (e.g., Department of National Defence).

February 28, she was also complaining of muscle aches and a dry cough. Mrs. K's condition continued to deteriorate, and she died at home on March 5, 2003. Family members did not want an autopsy and the coroner thought it unnecessary. On the death certificate, the coroner listed heart attack as the cause of death.

On March 7, 2003 two days after his mother's death, Mrs. K's 44-year old son, T C-K arrived at The Scarborough Hospital, Grace Division emergency department. He complained of a high fever, a severe cough, and difficulty breathing. He shared the open observation ward of a busy emergency department for 18 to 20 hours while awaiting admission. Only curtains separated him from nearby patients. By the next day, Mr. T's condition had deteriorated sufficiently that he was admitted to the Intensive Care Unit [ICU], and eventually required intubation—doctors inserted a tube through his mouth into his trachea, and attached it to a ventilator to help his breathing.

The physician who treated Mr. T was a respirologist and intensive care specialist who astutely suspected tuberculosis. He had not received any information about the mysterious respiratory illness in Guangdong. With tuberculosis a possibility, he isolated Mr. T, and asked the rest of the family to isolate themselves at home. He contacted Toronto Public Health. As per the usual protocol for tuberculosis, public health officials contacted the family, and made arrangements for chest x-rays and tuberculosis skin tests. According to Toronto Public Health officials, none of the family members reported feeling unwell.

Many patients and staff were exposed to Mr. T before he was placed in isolation, and two of the patients being treated in the Grace emergency department at the same time would also fall ill. Partly due to hospital overcrowding, Mr. T remained in the emergency department long after doctors had authorized a hospital admission. While waiting for a bed to be freed up, Mr. T received oxygen and vaporized medications (potentially capable of transforming infectious droplets into an infectious aerosol), and had numerous visitors.

DISCUSSION POINT

The SARS outbreak threw into high relief the state of Canadian emergency departments—the point of first contact for the sickest patients. As the Canadian Association of Emergency Physicians noted in its submission to the Committee, there are no national standards addressing emergency department design or operation, most departments lack adequate isolation facilities, staff may not be trained in infection control procedures, and "the current practice of housing large numbers of sick admitted patients for prolonged times in open, densely-populated emergency departments is a potential public health hazard." These phenomena reflect not only upon the funding and organization of emergency departments, but also the continued shortfall in ambulatory care capacity, and the need for primary care reform.

The new disease spread to other countries. An American businessman who also had stayed at the Metropole Hotel flew to Hanoi, Vietnam. Feeling unwell, he visited a local hospital on February 26, 2003 where over the next few days, several nurses also became ill. The hospital called the local WHO office, and Dr. Carlo Urbani was sent to investigate. On February 28, he informed the regional WHO office of the respiratory disease cluster. On March 6, 2003, still unable to determine the cause of the Hanoi outbreak, he placed a direct call to the WHO head office in Geneva. Dr. Urbani began to experience symptoms himself on March 11, and died 18 days later. His alarm helped contain the Vietnam outbreak.

Meanwhile, in Hong Kong, several dozen health care workers at the Prince of Wales Hospital were beginning to show symptoms. Twenty-three were admitted to an isolation ward on March 11, 2003.

On March 12, 2003, WHO issued a global alert regarding the mystery illness (soon to be called the severe acute respiratory syndrome, or SARS) that was occurring primarily among health care workers in Hanoi and Hong Kong. Physicians at several hospitals in Toronto involved in the first wave of the outbreak later advised that they were not informed of the alert by any level of public health—local, provincial, or national. The next day, these physicians discovered the WHO alert through their own intelligence gathering.

2C. SARS I: The Outbreak Begins
(March 13, 2003 - March 25, 2003)

Mr. T died on March 13, 2003. By this time, the tuberculosis tests results were available and negative, and several other family members were sick. Public health officials, in consultation with experts like Dr. Allison McGeer and Dr. Andrew Simor, connected the dots. There was an unusual respiratory illness in Guangdong that had apparently spread to Hong Kong. Mrs. K had recently travelled to Hong Kong. She had died at home. Soon after, her son had developed a respiratory illness that did not respond to the usual treatment. He too had died, and other family members were now developing symptoms.

The attending physicians recognized the need to prevent further transmission of a disease that was unequivocally contagious, but whose mode of transmission was unknown. They arranged transfers of Mrs. K's family members to hospitals with negative pressure isolation rooms, important in preventing transmission of airborne disease. Sunnybrook and Women's College Health Sciences Centre, Mount Sinai Hospital, and the Toronto Western site of the University Health Network all accepted family members. A granddaughter was admitted to the Hospital for Sick Children.

Mr. P, who had been treated in the emergency department bed adjacent to Mr. T on March 7, 2003 returned to The Scarborough Hospital on March 16 with respiratory symptoms, and a fever. He was admitted into the airborne isolation room in the emergency department, and managed in contact and droplet precautions before being sent to the ICU. However, his wife, who was with him in the emergency department, was not asked about illness until he was transferred to the ICU. Mr. P died on March 21; his wife and three other members of his family were infected. His wife infected seven visitors to the emergency department, six hospital staff, two patients, two paramedics, a firefighter, and a housekeeper.

The physician who intubated Mr. P in the ICU wore a mask, eye protection, gown, and gloves while performing the procedure, but he developed SARS. Anxieties about the infectivity of SARS were understandably magnified by this incident, especially when three nurses present at the intubation were also infected. Intubation procedures, a significant source of droplet production, would be a recurring cause of SARS transmission during the outbreak.

Another patient who was in the emergency department with Mr. T on March 7, 2003 became ill on March 13, and was brought back to The Scarborough Hospital by ambulance. He suffered a confirmed myocardial infarction—a heart attack. His contact with Mr. T was known, but the low level of his fever, and small infiltrate on his chest x-ray were thought at the time not to be compatible with SARS. Health care workers used only standard infection control precautions while treating the patient, and transferring him to York Central Hospital, a full-service community hospital north of Toronto. He would become the source of another SARS cluster that ultimately affected more than 50 individuals, and closed down York Central Hospital.

While Toronto fought a spreading SARS outbreak, British Columbia faced a different situation. The same day Mr. T died, before anything was known in Vancouver about the Toronto outbreak, a man who had also stayed at the Metropole Hotel in Hong Kong arrived at the Vancouver General Hospital with a flu-like illness. He lived with his wife, had not been in contact with family and friends, and went directly to the hospital when he became symptomatic. Infection control practitioners and the attending physician at the Vancouver General Hospital ensured that their index patient was masked, and quickly isolated. There were no reports of secondary transmissions from this case. In contrast, Mrs. K in Toronto was surrounded by a large family and sought only ambulatory care, and her ill son had no travel history to trigger suspicions upon his admission to hospital.

On March 13, 2003, Health Canada received notification of the Toronto cluster, and convened the first of what would become daily information-sharing teleconferences among federal, provincial, and territorial public health experts. On March 14, the Ontario Ministry of Health and Long-Term Care [OMHLTC] held a press conference with Toronto Public Health and Mount Sinai Hospital spokespersons about the cluster of atypical pneumonia cases. Media outlets began to cover the emerging story avidly.

SARS continued to spread at The Scarborough Hospital, Grace Division; patients, staff, and visitors developed symptoms consistent with the new disease. Grace closed its emergency and intensive care services on March 23, 2003, and began refusing new admissions and transfers from other hospitals. Outpatient clinics were closed, and employees were barred from working at other institutions. Anyone who had entered the hospital after March 16 was asked to adhere to a ten-day home quarantine. The hospital implemented stringent infection control policies including contact and droplet precautions such as hand washing, wearing gowns, gloves, N95 masks[3], eye protection, and the use of single or negative pressure rooms for all SARS patients.

On March 23, 2003, officials recognized that the number of available negative pressure rooms in Toronto was being exhausted. In a four-hour period on the afternoon of March 23, staff at West Park Hospital, a chronic care facility in the city, re-commissioned 25 beds in an unused building formerly used to house patients with tuberculosis. Despite the efforts of West Park physicians and nurses, and assistance from staff at the Scarborough Grace and Mount Sinai Hospitals, qualified staff could be found to care for only 14 patients.

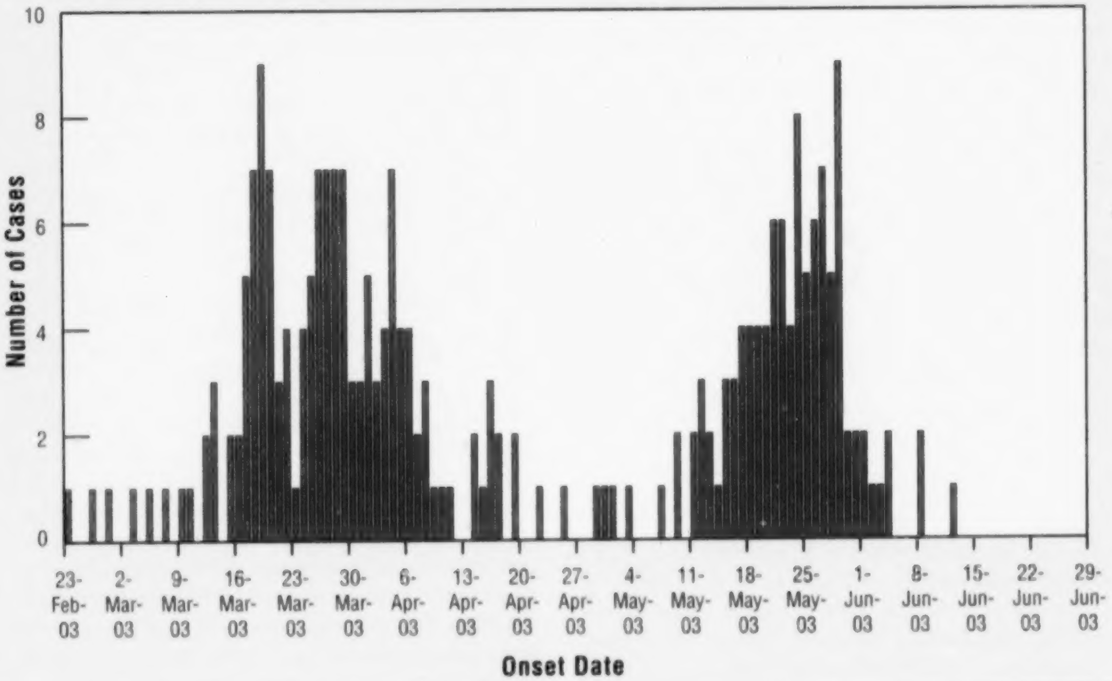
Faced with increasing transmission, the Ontario government designated SARS as a reportable, communicable, and virulent disease under the *Health Protection and Promotion Act* on March 25, 2003. This move gave public health officials the authority to track infected people, and issue orders preventing them from engaging in activities that might transmit the new disease. Provincial public health activated its emergency operations centre (better known as MAG for Ministry Action Group).

By the evening of March 26, 2003, the West Park unit and all available negative pressure rooms in Toronto hospitals were full; however, ten ill Scarborough Hospital staff needing admissions were waiting in the emergency department, and others who were ill were waiting at home to be seen. Overnight, with the declaration of a provincial emergency, the OMHLTC required all hospitals to create units to care for SARS patients. Accepting a lead role in the outbreak, Sunnybrook and Women's would, within 48 hours, put 40 negative pressure rooms into operation.

By March 25, 2003, Health Canada was reporting 19 cases of SARS in Canada—18 in Ontario and the single case in Vancouver. But 48 patients with a presumptive diagnosis of SARS had in fact been admitted to hospital by the end of that day. Many more individuals were

FIGURE 1

Number of Probable Cases of SARS in Canada, February 23 to July 2, 2003
(N=250), excludes 1 patient for whom onset date is unknown.



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[3] Respirators are designed to help prevent the inhalation of airborne particles by the user; the N95 mask is technically a respirator, and is designed to filter 95% of particles larger than one micron. Surgical masks trap droplets produced by the user, and help prevent the transmission of virus-containing secretions. During the SARS outbreak, many patients and visitors were asked to wear surgical masks.

starting to feel symptoms, and would subsequently be identified as SARS patients. Epidemic curves later showed that this period was the peak of the outbreak. On March 19, nine Canadians developed "probable" SARS, the highest single-day total. Taking "suspect" and "probable" cases together, the peak was March 26, and the three days, March 25 to 27 are the highest three-day period in the outbreak.

2D. The Emergency
(March 26, 2003 - April 7, 2003)

Ontario Premier Ernie Eves declared SARS a provincial emergency on March 26, 2003. Under the *Emergency Management Act*, the Premier has the power to direct and control local governments and facilities to ensure that necessary services are provided. The same day, the province activated its multi-ministry Provincial Operations Centre for emergency response, situated on the 19th floor at 25 Grosvenor Street.

All hospitals in the Greater Toronto Area [GTA] and Simcoe County were ordered to activate their "Code Orange" emergency plans by the OMHLTC. "Code Orange" meant that the involved hospitals suspended non-essential services. They were also required to limit visitors, create isolation units for potential SARS patients, and implement protective clothing for exposed staff (i.e., gowns, masks, and goggles). Four days later, provincial officials extended access restrictions to all Ontario hospitals.

Later, the Committee heard mixed opinions about whether Code Orange was justified. Several interviewees noted the massive number of cancelled services, and suggested that the collateral casualties from the suspension of health care activities may never be fully measured. Other harms were more subtle, including hardship caused by restrictions on visits between families and patients hospitalized with conditions other than SARS. These informants claimed the activation of Code Orange demonstrated a "lack of understanding of the system." They suggested that The Scarborough Hospital could have been closed and converted into a dedicated SARS hospital, with staff support from other facilities, while selected other hospitals began urgent preparations to become SARS-care centres. The remainder of the system could then operate with increased infection control precautions.

Other interviewees argued strenuously that the declaration of emergency and Code Orange were essential to galvanize infection control, and prevent unrecognized exposure by hospitals in the face of great uncertainty about the transmissibility of SARS.

DISCUSSION POINT

Ministerial leadership is needed to create system-wide outbreak management protocols, ideally of a graded nature commensurate with the severity of an outbreak. Many Ontarians experienced adverse effects from cancelled surgeries and delayed appointments. Ontario could put hospitals on "Code Orange" status (or not), but did not have a coordinated outbreak protocol for health and long-term care facilities and community-based health care providers. Do other Canadian provinces have such protocols in place? Are they harmonized with each other to permit interprovincial coordination in the event of a national outbreak? Has Health Canada taken a leadership role in creating template protocols and facilitating their adoption?

Dr. Jim Young, Ontario's Commissioner of Public Safety and Security, co-chaired the Provincial Operations Centre Executive Committee, and led the Executive and Scientific Advisory Committee in a lengthy and intense exercise to assess the pros and cons of designating one or more facilities as "SARS hospitals." Decision makers feared an outbreak would over-run any one or two designated SARS hospitals. The West Park experience suggested that the logistics of staffing a SARS specialty hospital would be extremely difficult. Concentrating SARS patients in a few institutions would put an enormous burden on these hospitals, and place their clinical personnel at great risk. Patients would still go to the emergency department nearest them, and language in current collective agreements constrained the ability of the system to move staff into new institutions. The team decided to build capacity for the management of SARS in multiple institutions. SARS patients were cared for at over 20 hospital sites scattered across the Greater Toronto Area.

2D.1 Information Technology and Data Sharing

On April 1, 2003, Dr. Ian Johnson, a professor and epidemiologist at the University of Toronto, was seconded to the OMHLTC to establish a SARS surveillance system. He had formerly served as associate medical officer of health for North York. Upon his arrival, Dr. Johnson immediately noted insufficient physical and human resources. Dr. Johnson later told the Committee that reporting structures were unclear, and the head office of the Public Health Branch was simply unable to provide optimal support for outbreak investigation and management. There were also frequent requests for data for the provincial government's daily press conferences.

Dr. Johnson characterized the province's infectious disease tracking and outbreak management software as "an archaic DOS platform used in the late eighties that could not be adapted for SARS." Several other key informants echoed this sentiment. In 2000, the Ontario Public Health Branch had led a process that developed a five-year plan to upgrade information technology, but it was not approved for funding.

This outdated software platform was assessed, and rapidly rejected by Toronto Public Health as unsuitable for the SARS outbreak. Toronto Public Health developed new software tools to deal with tracking cases and contacts; other local health units eventually followed suit as the outbreak spread. However, individual files for cases and contacts were maintained on paper charts that included colour-coded Post-It notes. Dr. Sheela Basrur, the city's chief medical officer of health, later commented that Toronto was using nineteenth century tools to fight a twenty-first century disease.

Several interviewees reported that data handling protocols were variously unclear or non-existent. Developing them during the SARS outbreak proved to be time-consuming and frustrating. One interviewee described the situation as "a turf war" on multiple levels. Offers of assistance from academic clinicians were rejected; infectious disease specialists and hospital epidemiologists set up a separate data system for clinical management and institutional infection control.

Health Canada officials were concerned that the Public Health Branch of the OMHLTC was, in the words of one informant, "completely overwhelmed". The Committee later learned that the personnel and infrastructure supporting Chief Medical Officers of Health are thin in several provinces.

DISCUSSION POINT

Provincial public health authorities are the next line of defence when an outbreak spreads beyond a single municipal health unit or overwhelms its capacity. Ideally, they provide leadership and coordination for public health activities province-wide. British Columbia has taken the additional step of building a public health focus for infectious diseases in the British Columbia Centre for Disease Control. Would Ontario have benefited from a similar agency at the provincial level? How do we build a second line of defence against outbreaks on a national basis? Ontario has also devolved public health functions to municipal control; expenses are divided equally between the provincial government and municipalities. Did this weaken Ontario's capacity to manage multi-jurisdictional outbreaks in a coordinated fashion?

Dr. Colin D'Cunha is Ontario's Chief Medical Officer and Commissioner of Public Health. He co-chaired the provincial emergency team with Dr. Young. Dr. D'Cunha advised the Committee that Toronto Public Health was initially overwhelmed, and not able to generate timely data in the first two or three weeks of the outbreak. Another informant noted that Toronto has 1,800 public health employees, and wondered if the city had maintained a large enough outbreak management and infectious disease unit.

Dr. D'Cunha stated that protection of patient confidentiality constrained his ability to release data to Health Canada. Senior GTA public health physicians took the same view of their obligations to share data with the Ontario Public Health Branch. Health Canada informants in turn argued that they never wanted personal identifiers, simply more detail to meet WHO reporting requirements. Multiple informants noted that relationships among the public health officials at the three levels of government were dysfunctional.

A memorandum of understanding on data sharing was never finalized between the province and the federal government. High-level public health officials in Ontario and Health Canada have since given the Committee sharply divergent views on how well information flowed with respect to both its timeliness and adequacy. It is clear that at points during the outbreak, Dr. Arlene King of Health Canada dealt directly with Dr. Johnson and local public health officials to acquire the more detailed data necessary for discussions with WHO. Local public health units in turn faced pressure from the Ontario Public Health Branch to send on data for press conferences, for reports to Health Canada, or both.

DISCUSSION POINT

The lack of a modern database accessible to local, provincial, and federal health authorities had adverse impacts on the flow of information to the public and international agencies. The absence of appropriate and shared databases and capacity for interim analyses of data, also interfered with outbreak investigation and management, and constrained epidemiologic and clinical research into SARS. Agreements for data sharing between different levels of government, and the necessary information technology, were apparently not in place before the outbreak. Who is responsible for developing such protocols? What kind of information systems could help prevent future problems? How can officials ensure the confidentiality and security of patient data while facilitating the necessary access and analyses?

A senior public health physician, on secondment to WHO during the SARS outbreak, assessed the jurisdictional tensions bluntly after a visit to Canada in May: "The system is sick. It's broken."

2D.2 Scientific Advisory Committee

Another group that complained about insufficent data was the Scientific Advisory Committee [SAC], an *ad hoc* group of experts that started as a "human-cellphone conglomerate" of concerned physicians, infection control practitioners, and administrators from across the country. Made up of volunteers who essentially dropped whatever they were doing to assist in the Toronto outbreak, the committee members worked long hours, seven days a week. Several Toronto physicians were integral members, but when Dr. Allison McGeer fell ill, and five core members were forced into quarantine, Dr. Dick Zoutman, a hospital epidemiologist and medical microbiologist from Kingston, moved to Toronto and assumed the chair. "Handcuffed" by inadequate amounts of information, Dr. Zoutman later commented that his group "wanted desperately to get into the epidemiology, but had no data, capacity, or time to do so."

The SAC was charged with developing quarantine guidelines and hospital directives covering topics such as restricted access, isolation precautions, employee screening, and patient transfers. The directives were passed to the director of the Hospitals Branch of the OMHLTC and her staff, who reworded them to facilitate implementation by administrators, or, as the team called it, "translation into 'Hospitalese'."

Preparing directives under intense pressure, the SAC occasionally lost track of draft versions in the early going, but soon devised the necessary protocols. The SAC also had to manage a frequently changing membership as some physicians returned to their "day jobs". Along with offering high praise for the SAC's chair and members, interviewees later wondered why the committee did not include representatives with expertise in anaesthesia, paediatrics, or respiratory therapy. Representation from family medicine came later in the outbreak, when it was recognized that primary care input was essential to generate directives for physicians practising in community settings.

Nuances were sometimes lost and meanings blurred as directives were processed through various channels. A specialist who participated on the SAC later stated: "At times, the directives issued to the hospitals appeared to be significantly different than directives that were agreed to by the [SAC] members and proved to be very confusing for the hospitals." Several clinical and administrative leaders raised concerns that early directives were not field-tested, lacked a scientific basis or were operationally impossible. Dr. Jim Young noted, however, that the situation required "decisive action, not perfection. Every hour that we wasted was more people getting infected."

A controversial directive was the requirement that health care workers wear fit-tested N95 masks. Neither the fit-testing (a complex operation requiring a subject to try various mask designs while a bitter-tasting gas circulates underneath a hood), nor the appropriateness of the N95 standard itself had been fully discussed by the SAC. Given that SARS was being spread primarily via droplets, some informants questioned whether N95 masks were necessary. Others stressed that the disease should be treated as airborne until more information was available.

Notwithstanding the debate about the necessity of N95 masks, fit-testing was felt by almost all to be operationally impossible. The Provincial Operations Centre issued the edict that health care workers should wear fit-tested masks, but no support was provided to hospitals to ensure this would happen. Confusing matters further, unions such as the Ontario Public Service Employees Union attempted to fulfil their safety mandates by issuing their own health alerts and recommendations. The Ontario Nursing Association was alarmed by the lack of fit-testing and non-compliance with the provincial directive, and launched grievances to protect front-line nurses.

DISCUSSION POINT

The Scientific Advisory Committee [SAC] was a hastily-assembled group of tireless volunteers. With over 200 SARS patients in Toronto, infectious disease experts were spread thin—and the city had only a handful of hospital epidemiologists. Their ability to participate in SAC deliberations was limited, and when they were able to participate in person, the entire committee was at risk of being infected with the SARS virus. Should a body similar to the SAC already have been in place? The CDC has recently initiated the use of a "B [or Brains] team" to provide scientific backup and sober second thoughts in the midst of what is often a crisis atmosphere. What kind of structure should be in place in the provinces or nationally to ensure the requisite scientific support for outbreak investigation and 'B team' functions? Who should issue directives to health care workers and institutions, and what kind of support should be provided to facilitate compliance?

2D.3 Leadership

Various interviewees acknowledged the indefatigable leaders of the emergency response, but remarked that, as one put it, "we never knew who was in charge." Dr. D'Cunha and Dr. Young jointly led the Provincial Operations Centre. Many interviewees noted tensions between the two physicians, as well as their differing management styles. In separate interviews, both Drs. Young and D'Cunha acknowledged that the dual leadership structure was less than ideal, and one person should have been in charge. Matters were further complicated as other branches of the OMHLTC helped to manage the interactions with hospitals, long-term care facilities, physicians, and various elements of the health service system. A number of physicians involved in caring for SARS patients began actively discussing whether and how the management of the outbreak could be handed over to a single "SARS czar".

At the federal level, similar themes emerged. Staff at the Health Canada Regional Office in Toronto felt they could have played a greater role given their proximity to the crisis, and their ability to gather intelligence locally. A pre-existing F/P/T Pandemic Influenza planning committee became the nidus for daily SARS teleconferences organized by Health Canada, but representatives from Ontario were too busy dealing with the outbreak to join in. Several senior Health Canada personnel from Ottawa who came to help in Toronto were identified for praise by interviewees. However, fairly or not, most informants contrasted the response of Health Canada's Population and Public Health Branch with the high standard of federal support set by the CDC in the United States. One provincial health official later commented that "Tunney's Pasture is good for general advice, and Ottawa has a big chequebook, but the feds lack operational credibility."

DISCUSSION POINT

Emergency situations are inherently stressful. Public health crises require clear leadership at the municipal, provincial, and ultimately national levels as their scope widens. Who should provide these differing levels of leadership? What kind of an organizational structure would work best? Some informants questioned the embedding of the response to SARS, a public health crisis, in Ontario's general emergency management structures. Should there be a category of health emergencies distinct from the general emergency machinery at the provincial and federal levels?

2D.4 Health Canada's Role

According to Health Canada's internal communications, on March 14, 2003, the federal government sent "six infectious disease and epidemiology experts to help with the investigation of SARS cases," with "an additional eight experts" sent on April 1. In contrast, a provincial official later commented that Health Canada sent three trainees from its Field Epidemiology Program to do a research project with Toronto Public Health. It appears that about a dozen Health Canada personnel of varying levels of seniority were actually on the ground in Toronto for much of the outbreak, but largely invisible. Senior federal personnel were closely involved in investigating a number of SARS clusters, kept other provinces and territories prepared for SARS, and managed the international liaison. However, federal involvement in Ontario was limited by the lack of a delineated role in an organizational structure, lack of data for outbreak investigation, and absence of business process agreements for inter-jurisdictional collaboration.

For example, a group of field epidemiologists from Health Canada first worked with Toronto Public Health, and then were moved to a OMHLTC office at 5700 Yonge Street where their duties included data entry. Their mentors in Ottawa objected to this deployment of skilled personnel, and the field epidemiologists were demoralized. Others were sent in to help on a rotation system, but this was suboptimal. A member of the SAC commented that "the on-the-ground help from Health Canada seemed to come on five-day contracts so there was no continuity." For their part, the field epidemiologists were critical of the lack of provincial organization, and nonavailability of data. On April 30, Health Canada pulled back the field-epidemiologists from the provincial office, a move that some informants deemed unsupportive and ill-advised.

The federal government convened an invitational "SARS Summit" in Toronto on April 30 and May 1, 2003, setting out the framework for a national SARS strategy. The event helped to promote a commonality of purpose in the struggle against SARS, although some front-line clinical and public health physicians who had been fighting SARS at ground level later wondered why they were not invited. Health Canada also facilitated the purchase of approximately 1.5 million N95 masks for the National Emergency Stockpile System [NESS], and sent 10,000 to Toronto health officials.

Discussion Point

In the United States, as in Canada, responsibility for outbreak management progresses through local and state public health chains of command. However, the Centers for Disease Control and Prevention [CDC] is generally 'invited early and often' to become involved with any serious outbreak. Its credibility mitigates jurisdictional tensions. The same cannot be said at present for the Population and Public Health Branch of Health Canada. How can we build federal capacity to support provincial and municipal officials in battling disease outbreaks? What collaborative hierarchy of roles and responsibilities can be devised that reflects the unique nature of Canada's federation?

2D.5 Public Communications and Media Relations

Health Canada, the OMHLTC, and Toronto Public Health all issued regular SARS updates on their websites. Televised SARS press conferences were a daily feature of national newscasts—Drs. James Young, Colin D'Cunha, and Sheela Basrur became household names. Dr. Donald Low, chief microbiologist at Mount Sinai Hospital and professor of medicine at the University of Toronto, emerged as one of the unofficial leaders of the SARS battle, and sometimes joined the official press conferences. He and other infectious disease leaders also did numerous unscripted interviews.

Many observers felt that interaction with the media became an end in itself during the outbreak. Several Committee informants felt the impression created was one of too many "talking heads" whose opinions sometimes diverged. Singapore, in contrast, held an evening press conference with a single spokesperson, the Minister of Health, leaving public health officials and infectious disease experts to focus on the outbreak. A senior physician later questioned why the media profiled the cumulative counts of probable and suspect SARS patients, rather than the relatively unimpressive daily incidence statistics (as per figure 1). There appeared, however, to be no coherent communications strategy aimed at dispelling the sense of deepening crisis.

2D.6 Research

On March 15, 2003, WHO established an international network of laboratories to find the agent responsible for SARS. The speed of the investigation was unprecedented—barely a month later, WHO announced that a previously unknown member of the coronavirus family had been conclusively identified as the most likely culprit.

Discussion Point

Communications was among the issues raised in a compelling letter to the Committee, signed by the presidents or chief executives of nine major health care groups—the Canadian Medical Association, the Canadian Public Health Association, the Canadian Nurses Association, the Canadian Healthcare Association, the Canadian Dental Association, the Association of Canadian Academic Healthcare Organizations, the Canadian Pharmacists Association, the Canadian Association of Emergency Physicians, and the Canadian Council on Health Services Accreditation. They wrote:

"During a crisis or emergency, the public will quickly begin to look for a trusted and consistent source of information. However, during the early days of the SARS crisis, in Toronto, there were occasions when several different public health officials were being quoted and had titles attributed to them that appeared to indicate they were responding in an acting capacity only and not as an "official". This had the potential to leave an impression with the public that no one with any authority was in control. Establishing one individual with authoritative credentials as the chief spokesperson creates public confidence, and lends credibility to the messages. How the crisis or emergency is reported is just as important as how it is actually handled. It is also crucial that the public, and the media have a clear understanding of the language of the crisis so that clear, consistent messages are communicated and received. Governments across jurisdictions must develop an emergency plan to which all parties are committed regarding leadership in communications."

The first scientific papers describing SARS were published on the *New England Journal of Medicine* website on March 31, 2003; one came from Hong Kong and the other from Canada. In the following weeks, researchers from Hong Kong flooded the medical journals with important analyses—eight major publications appeared in *The Lancet* alone. Several more were spread between the *British Medical Journal*, *Science* and the *New England Journal of Medicine*.

In the same period, Canadian researchers published two more articles in the major international journals. One was an important breakthrough, albeit quickly repeated in other jurisdictions—researchers from British Columbia and Winnipeg described the genetic sequence of the Toronto SARS virus in *Science*. Later, a team of doctors from Toronto depicted the clinical features of SARS in *JAMA - the Journal of the American Medical Association*.

While researchers in Hong Kong were busy correlating clinical and laboratory features of SARS with epidemiologic data, this did not occur in Toronto. The first clinical paper from Toronto was compiled with minimal input from public health officials; its lead author was a resident physician just two years out of medical school.

Some of Toronto's infectious disease experts were too busy taking care of patients to find time for research. Others were occupied by SAC deliberations. Multiple informants praised the work done by infectious disease and infection control specialists who supported a wide range of activities inside and outside their home institutions. They and countless health care workers rose daily to the challenge of battling SARS, placing themselves at risk to battle a new and contagious disease with a significant mortality rate. As one academic physician later ruefully commented, "It doesn't show up on my CV if I'm in the trenches battling SARS." However, even had an appropriate database been in place, the required machinery and supporting personnel may well have been insufficient to allow either appropriate outbreak investigation or the associated epidemiologic and clinical research.

On July 26, 2003, a major paper with multinational authorship was published in *The Lancet*, providing data in support of the proposition that the new SARS-associated coronavirus had met the criteria to be designated the causative agent of the new disease. Patient data were included from six countries: Hong Kong, Singapore, Vietnam, Germany, France, and the United Kingdom. No Canadians appeared among the 22 authors, and no Canadian patients were included in the study sample.

DISCUSSION POINT

Outbreak investigation and research shade together. For example, provisional analyses of data during an outbreak allow researchers to estimate incubation periods (the length of time necessary to quarantine a contact), and devise treatment protocols. Canadian researchers were hamstrung by patient care and scientific advisory responsibilities, a lack of data, infighting about data access, limited research funds, and the need to obtain ethics approvals at multiple institutions. Submissions to the Committee by the Canadian Association of Medical Microbiologists, among others, have recommended establishing a common ethics review board for outbreak situations, developing guidelines to ensure that outbreak data are made available to all interested researchers (ownership and authorship issues should not be of primary importance during an emergency), and assembling a dedicated and experienced research team early in an outbreak.

2D.7 Laboratories

Within 24 hours of receiving the initial specimens from SARS patients in early March 2003, the National Microbiology Laboratory in Winnipeg ruled out all known respiratory pathogens. The laboratory was a key member of the WHO network responding to SARS, and helped develop and refine diagnostic tests for SARS. Over the course of the first and second outbreaks, the laboratory tested several thousand specimens that included blood, sputum, stool, urine, and nasopharyngeal aspirates. At one point, the laboratory was receiving 600 specimens per day, but had sufficient surge capacity to accommodate the load.

Patient samples often arrived with no epidemiologic or clinical data—sometimes, even basic identifying data were incorrect or missing. More disconcerting was the finding that over 170 individuals who did not have SARS—at least according to restrictive case definitions—tested positive for the virus. Although some results may have been false positives (i.e., due to imperfect tests or specimen contamination), scientists were concerned that members of this group represented an opportunity for the virus to spread unchecked into the general community. The absence of a central database made finding these individuals and their contacts more difficult than it should have been—a situation that one informant called "very frustrating and dangerous."

In contrast, the Central Provincial Public Health Laboratory in Toronto was unable to provide optimal support during the SARS outbreak. Senior physicians advised the Committee that microbiology laboratory capacity nationally has eroded in recent years; and in Ontario, the Central Laboratory was unable to keep up with the testing volumes involved in previous outbreaks of West Nile and Norwalk virus. A number of infectious disease specialists suggested that there remains an urgent need for rapid and coordinated laboratory testing for SARS and related viral diseases, especially with the fall flu season approaching.

With the provincial lab overwhelmed, some hospitals sent specimens directly to the National Microbiology Laboratory, bypassing the usual hierarchy of referral. The Hospital for Sick Children, Mount Sinai, and Sunnybrook and Women's had strong platforms in polymerase chain reaction technology—an elegant laboratory testing modality that identifies microorganisms by analyzing strands of their DNA or RNA. They became the *de facto* and unfunded referral centres for Toronto SARS testing.

DISCUSSION POINT

The Canadian Public Health Association advised the Committee that "current inabilities or unwillingness to share information within the laboratory network are aggravated by the fact that three sectors—the public, private, and voluntary sectors at three levels—the municipal, provincial, and federal levels—provide laboratory services." Standardized testing and coordinated collection/sharing of data would help inform outbreak management. How should the hierarchy of referral and responsibility be organized for laboratory testing during outbreaks? Who should set and police standards? How can we strengthen relationships between laboratories and clinical services, public health and government regulators? How do we address the supply, recruitment and retention of medical microbiologists and virologists in public health laboratories?

2D.8 Clinical Challenges

SARS was and remains a challenging disease to diagnose and treat—it presents with nonspecific symptoms, it has no hallmark abnormality on physical exam or biochemical testing, and there is still no unequivocally effective treatment. Toronto-area hospitals and clinicians had never faced an outbreak like SARS. Clinics designed specifically to assess potential SARS cases were created at several sites in the GTA to relieve the burden on emergency departments, and to help prevent further transmission. Once identified, SARS patients were cared for at numerous hospitals across the city during the first wave of the outbreak.

Other countries used different strategies—in Singapore, for example, authorities concentrated all SARS patients in one hospital. Hong Kong tried to centralize SARS care in a single institution but its capacity was rapidly exceeded. In Beijing, officials ordered each hospital to establish a "fever clinic" that could assess patients at risk of having SARS; then, in just eight days, construction workers built a thousand-bed SARS hospital on the city's outskirts.

In Toronto, infectious disease specialists, clinical chiefs, and intensive care specialists held daily teleconferences to discuss treatment options, and review the number of cases at each hospital. As with any new disease, treatment plans for SARS were designed and implemented with little or no evidence to back them up. Typically, a patient admitted with SARS would receive supplemental oxygen as required, antibiotics to cover a potential bacterial infection, and possibly—depending on the treating physician—ribavirin, a potent medication known to be effective against a variety of viruses. Steroids were used for patients with worsening respiratory symptoms, a clinical scenario that apparently corresponded to an excessive and counterproductive inflammatory response in the lungs.

As the doctors in Toronto gained experience, they concluded that ribavirin was likely causing more harm than good. Many patients receiving it were developing toxic side effects like red blood cell breakdown and liver dysfunction, and many patients who did not receive the antiviral medication were recovering. This information, coupled with *in vitro* testing (i.e., in the laboratory) showing little or no effect on the SARS coronavirus, led Canadian physicians to stop prescribing ribavirin. Clinicians in other countries continued to use ribavirin, but in smaller doses that limited its side effects. Even in this era of evidence-based medicine, SARS forced physicians to trust their instincts—and their colleagues' collective wisdom.

By the end of the first week of April 2003, 91 probable and 135 suspect SARS cases had been reported in Canada. Ten people had died.

2E. The Quest for Containment
(April 8, 2003 – April 23, 2003)

2E.1 Public Health's Fight

Public health officials in York and Toronto continued to trace and quarantine contacts with good results. The outbreak management teams and leaders of the local public health units were identified by some interviewees as those who deserve greatest credit for containing the SARS outbreak.

Nonetheless, concerns mounted that SARS was poised to spread into the community. Individuals who attended a funeral on April 3, 2003 were quarantined when some family members developed symptoms. An employee of a large information technology company defied quarantine, and returned to work while symptomatic; one co-worker contracted SARS, and nearly two hundred more were sent into isolation. A Scarborough school was closed by Toronto Public Health when one student, a nurse's child, exhibited SARS symptoms; four other schools would be closed by local school boards as a result of SARS concerns before the outbreak ended. Routine screening picked up a fever in a nurse caring for SARS patients—a hurried search to identify her fellow commuter train passengers ensued.

Because Toronto was the only city outside Asia to be hit hard by SARS, the international media converged on the city like never before. The attention was not only unprecedented; it was unwanted. Despite the media attention, there was no evidence that the SARS epidemic was spreading through the community. The Amoy Gardens outbreak in Hong Kong, where the virus may have been transmitted through a defective sewer system, was an exception that proved the rule—the SARS virus was spread by either brief exposure to big doses of viral particles or close, prolonged contact. All but a few Canadian cases occurred in travellers, health care workers, and their immediate contacts. Using traditional surveillance, contact tracing, and quarantine, opportunities for community transmission were being identified and contained.

The number of people quarantined grew daily. Very occasionally, someone would refuse to enter isolation, and public health officials had to resort to legal means to enforce compliance. But this was the exception; Torontonians were generally remarkably compliant with highly demanding strictures. Quarantined individuals lost income, suffered from boredom and loneliness, and most importantly, were fearful that they might develop SARS or that they may have spread SARS to family and friends.

Committee informants commented that different public health units seemed to have different thresholds for the use of quarantine. A related issue is whether public health officials used quarantine too frequently. Some interviewees believed they did—one noted that while Beijing had 2,500 cases of SARS compared to Toronto with 250, both cities quarantined about 30,000 individuals. Beijing quarantined fewer people per SARS case because they focused on close contacts (e.g., household members, hospital visitors, and those who might have come in contact with bodily fluids). On the other hand, the higher caseload of probable and suspect SARS in Beijing might actually have been a result of too-limited use of quarantine.

Perhaps the greatest scare of the Toronto outbreak occurred on April 12, 2003 when a cluster of SARS cases was identified in a close-knit religious community. Remarkably, it had begun with exposure back in mid-March of several members of a large extended family at the initial epicentre—The Scarborough Hospital, Grace Division. Over the ensuing weeks, the infection spread quietly through the extended family and some close friends, health care workers who cared for them, and then into a religious group. In all, 31 cases, including three health care workers, were associated with this cluster. Public health workers employed active surveillance and quarantine to control the spread of infection, and unchecked community transmission never materialized.

As residents of their jurisdictions became exposed through the religious group cluster, public health units in the surrounding regions of Durham and Peel joined Toronto and York in trying to stop the outbreak. The various units collaborated, but there was no overarching coordination across jurisdictions. Hospitals later complained that they were sometimes contacted separately for information about the same patient by two public health units. Hospitals were also fielding requests for information from the OMHLTC Hospital Branch, the Public Health Branch, and the Provincial Operations Centre. Understandably, it appeared to those on the clinical front lines that public health officials were not communicating with each other. Meanwhile, in Toronto, local public health workers were nearing exhaustion—all non-SARS activity in infectious diseases and many other provincially-mandated programs had been suspended, and virtually all qualified employees were working on SARS full time.

The monumental efforts of public health workers played a critical role in the containment of SARS. Toronto Public Health, for example, investigated 1,907 separate reports in addition to 220 cases of probable or suspect SARS, each of which involved several hours of investigative work, independent of contact tracing. A pair of papers later published in *Science* provided estimates of the "infectiousness" of the SARS virus. Both papers lead one toward the same conclusion: although SARS is only moderately transmissible, left unchecked it could have infected millions of people worldwide. Whether it would have done so before mutating into a more benign form is, fortunately, still unknown.

2E.2 Primary Care

Although most of the attention during the outbreak was directed toward hospitals, several instances of patients transmitting SARS to their family doctors produced apprehension. One academic family physician voiced concern as early as March 28, 2003: "Family physicians, just like hospitals, need precise and explicit directions for screening patients, and for contending with suspect or probable SARS patients who might make it past the screening system." They also "required full protective gear in the unlikely event that a SARS patient did make it into their offices." He suggested that family physicians could be used as sentinels—reporting cases of pneumonia to a central authority might pick up SARS clusters where there was no obvious epidemiologic link.

Guidelines for family doctors were eventually issued on April 3, 2003 via the fax and e-mail network of the Ontario Medical Association. These instructions outlined three goals: first, to keep potential SARS patients out of doctors' offices using signs, pre-recorded telephone messages and screening questionnaires; second, to safely treat any SARS patients that did enter the office; and third, to protect physicians and staff from infection. Some informants later suggested that the guidelines were difficult to implement in community-based practices.

More problematic was the lack of a system to distribute the necessary protective gear. The Ontario Medical Association proposed that the fastest strategy was for family doctors to buy their own supplies where they could, and apply for reimbursement later. A growing number of family physicians, however, were concerned by the lack of provincial support. On April 15, Drs. D'Cunha and Young convened a meeting of family doctors, hospital CEOs, and chiefs of emergency medicine at a downtown hotel. Family doctors left the meeting frustrated that the province had still not developed a plan to distribute protective equipment to physicians and their office staff. On April 21, 2003, almost four weeks after the Province of Ontario declared an emergency, the province finally used its vaccine distribution network to provide family doctors with protective equipment.

DISCUSSION POINT

During the SARS outbreak, several family physicians were infected with SARS. Because most people visit their family doctor (rather than an emergency department) when they are unwell, family doctors need protocols, protective equipment, and prompt information during infectious disease outbreaks. How can we better support community physicians during extraordinary situations? How can we improve communication between public health officials and the primary care sector? What about other community care agencies? How do they fit into the scheme of disease surveillance and outbreak response?

2E.3 Transmission of SARS to Protected Health Care Workers

On April 13, 2003, on the Sunnybrook and Women's SARS unit, a family doctor who may have been infected with the SARS virus while caring for several members of the religious group cluster began to suffer from increasing shortness of breath. He was transferred to the ICU. Once there, non-invasive devices were used to assist his breathing. None worked, and doctors decided he required intubation. The entire ordeal (from transfer to intubation) took several hours. Many health care workers were exposed to the patient's coughed-up secretions or the aerosols generated by devices to assist his breathing. Both were rich with SARS viral particles.

By the following week, 11 health care workers present during either the transfer or the intubation became ill. On April 20, 2003, Sunnybrook and Women's closed its SARS unit and its ICU. Canada's largest trauma centre stopped accepting trauma patients. Investigators from the CDC were invited north to join a team attempting to shed light on how health care workers using all recommended precautions could have been infected. The team concluded that direct contact with the patient or a contaminated environment might have led health care workers to contaminate themselves as they removed their protective gear; alternatively, the patient's coughing or the assisted ventilation might have led to airborne spread.

The concept that minor breaches in protocol led to infection was upsetting to some professionals who saw these findings as a veiled criticism. The possibility that their own inadvertent and minor breaches in protocol could lead to infection was disturbing to some professionals who saw these observations both as further evidence of the risks of SARS care and also as an indirect criticism. However, most physicians and nurses had little recent experience with droplet precautions for a virus such as SARS. Hospitals redoubled their efforts to train health care workers covering SARS units.

Sunnybrook and Women's continued to carry the largest volume of SARS patients in the GTA, but many of its physicians with relevant expertise or experience were now ill or in quarantine. The hospital's administrators, clinical chiefs, and involved clinicians put out desperate requests for support through numerous channels. Other Toronto institutions were either struggling with their own SARS load or unwilling to help. One sister hospital eventually sent one senior resident to help with general medicine coverage, freeing up on-site staff to concentrate on SARS patients.

The military sent a critical care specialist. One physician arrived from the United Kingdom, another came from Montreal, and the chairman of medicine at the University of Ottawa offered to assemble reinforcements if necessary. Further support came only after the province retained a private placement agency to help with recruitment, but the agency's pay scales for professionals would later become a point of contention.

DISCUSSION POINT

Ontario is the only province that has not adopted regional administration of health care. The merits of regionalization in general are subject to ongoing evaluation. However, the GTA lacks any truly regional plan for clinical services or health emergencies. More generally, clinical jurisdictions across Canada do not have defined response teams for health emergencies that can move between hospitals, let alone across regions or provincial boundaries. The Canadian Medical Association has proposed a 'grid system' for personnel to support health emergencies. Should a system of health emergency response teams be created within and across regions and provinces?

Meanwhile, in British Columbia, the transmission of SARS to a nurse caring for SARS patients forced the closure of a ward at the Royal Columbian Hospital near Vancouver on April 19, 2003. This was the first case of secondary transmission in British Columbia; the other three probable SARS patients in British Columbia had contracted the disease outside the country.

2E.4 WHO Travel Advisory

As the Easter and Passover holidays approached, public health officials braced themselves for a large spike of cases emanating from the religious group cluster. Both public health officials and clergy stressed repeatedly that people under quarantine should remain home, and avoid public religious services. Catholic churches also instituted precautionary measures—communion wafers were placed in hands rather than mouths, and confessions took place outside the usual booths. At diverse religious gatherings handshakes were replaced with smiles.

The expected wave never occurred. By April 23, 2003, only one individual—a member of the religious group—had developed SARS in the previous two weeks. But just as confidence within the city began to grow, WHO issued an unprecedented advisory, recommending that visitors to Toronto postpone all but the most essential travel. The United Nations agency was concerned that "a small number of persons with SARS, now in other countries in the world, appear to have acquired the infection while in Toronto."

Three months after WHO issued its travel advisory against Toronto, Health Canada officials remain mystified about WHO's reasoning and motivation. As one Health Canada physician told the Committee, "The travel advisory was an absolute stunner... We were of the belief, based on the epidemiologic data, that the outbreak was dwindling rapidly." Some informants have since speculated that WHO officials were concerned about the appearance of a double standard favouring Toronto. WHO travel advisories had already been issued for Hong Kong and Guangdong, and advice against non-essential travel to Beijing and China's Shanxi Province was given on the same day as the Toronto advisory.

Singapore had 189 probable cases on April 23, 2003 compared with 140 for Toronto, as well as transmission at a community market. Epidemic curves comparing the outbreaks in Toronto and Singapore are strikingly similar (see Chapter 11). However, Singapore's management of the outbreak, not least its communications strategy, was superbly organized and reflected a remarkable degree of social solidarity that could not have been lost on WHO. The Committee has also learned that regional WHO offices had different levels of interaction with nations affected by SARS, and were therefore more or less able to vouch for the containment of the outbreak.

The WHO travel advisory criteria themselves came under intense criticism—they included the presence of at least 60 probable SARS cases, export of SARS to other countries, as well as community spread. Yet none of these criteria have ever been validated as reasons for issuing a travel advisory. For example, the absolute number of cases in an outbreak is largely a function of the size of a community. Issuing a travel advisory does not prevent residents of a SARS-affected area from leaving and taking SARS with them. Indeed, of the six people thought to have spread SARS from Canada, only one was a visitor returning home after a trip to Canada. Finally, "spread into the community" was never explicitly defined—if a nurse with SARS infects his/her spouse, is this considered community transmission?

DISCUSSION POINT

Whether the WHO travel advisory was justified or not is debatable. What is beyond debate is the fact that the economic and social impact of such advisories can be devastating. What is the process whereby different nations and international agencies such as WHO generate criteria for travel advisories, and proceed to issue them? What are the benefits and harms of travel advisories? In the case of Canada, to what extent was international confidence in our ability to manage SARS undermined by lack of coordination among jurisdictions, shortage of data, and the lack of a coherent communications plan?

2F. Between the Waves
(April 24, 2003 - May 22, 2003)

> *"I can tell you definitely we are in better shape today than we have been in a month...Where did [the WHO] come from? Who did they see? Who did they talk to? Did they go to our hospitals, did they go to our clinics, did they go anywhere? They sit somewhere, I understand Geneva, I don't even know where the hell they came from, but Geneva or someplace and they make decisions..."*
>
> *—Mayor Mel Lastman, at a press conference, April 23, 2003*

The WHO-issued travel advisory came just as local and provincial health officials felt that they were winning the battle against SARS. This perception was strengthened by media spokespersons, front-line clinicians, and by the federal government. The Prime Minister also announced the formation of the National Advisory Committee on SARS and Public Health.

The WHO advisory, which was initially to have been in place for at least three weeks, was withdrawn on April 30, 2003 after visits to Geneva by a delegation that included Ontario Health Minister Tony Clement and the Public Health Commissioner, Dr. D'Cunha. In return, Canadian officials gave assurances to WHO that they would intensify screening of travellers to and from Canada to prevent export of the disease.

On May 14, 2003, WHO removed Toronto from the list of areas with recent local transmission. This was widely understood to mean that the outbreak had come to an end. Consistent with the notion that the disease was contained, the Premier of Ontario lifted the emergency on May 17. Directives continued to reinforce the need for enhanced infection control practices in health care settings. Code Orange status for hospitals was revoked, and the Ontario government announced a provincial panel to study the response to SARS, chaired by Dr. David Walker, dean of medicine at Queen's University. The Provincial Operations Centre was dismantled. The physician-in-chief of a major teaching hospital later observed that there was "a great and understandable rush to make things normal again after SARS I."

By mid-May, all levels of government were presenting a unified picture to the public that SARS had been contained. Rather than presenting data about the cumulative number of people labelled with probable or suspect SARS, health officials began to highlight the declining number of "active" cases and the number of new cases—figures that were not only more reflective of disease activity but also less dramatic. Health Canada began to issue bulletins only weekly, and reported in its May 21, 2003 update that no Canadian had experienced the onset of symptoms for over a month.

It appeared that the total number of cases had reached a plateau—140 probable and 178 suspect infections. Twenty-four Canadians had died, all in Ontario.

2F.1 Hospital Infection Control

Starting in late April 2003, hospitals began to ease their infection control precautions. Employees working outside designated SARS areas were, in most hospitals, relieved of their obligations to wear personal protective equipment for all patient contact. Rules regarding the minimum distance separating co-workers during meals were relaxed. Hospitals began increasing the number of patients allowed visitors. Relieved that SARS had passed, staff went back to their usual routines. Hindsight would reveal that vigilance for SARS and stringent protective measures should have been maintained for at least a few more weeks.

Provincial directives required hospitals to isolate patients with fever and respiratory symptoms in either the hospital or the emergency department until SARS had been ruled out, but there was no recommendation for formal, hospital-based surveillance programs. The SAC had actively discussed the need for heightened surveillance. Its functions, however, were being wound down. Public health officials viewed syndromic surveillance as a matter for institutional infection control and outside their mandate; they lacked resources to implement such a program in any case.

Hospitals responded by treating all patients admitted with community-acquired pneumonia as potential SARS cases until proven otherwise. Most took special precautions with inpatients who developed respiratory symptoms suggestive of infectious disease. Some hospitals also did "fever surveillance." For example, at York Central Hospital, all inpatients had their temperature checked twice daily. Chest x-rays were ordered for all York Central inpatients with fever and respiratory symptoms and they were isolated promptly; and until SARS could be ruled out, a specialist in lung diseases assessed and treated all pneumonia patients in isolation. Similar measures were used in Singapore health care facilities.

Although infection control practitioners attempted to institute comprehensive surveillance programs in some hospitals, such a program alone requires approximately 2 full-time staff members for a 500-bed hospital, more than the majority of hospitals have on staff for all infection control tasks. At North York General Hospital, for example, one full-time and one part-time infection control practitioner were responsible for 425 acute care beds. The infection control director, Dr. Barbara Mederski, occupied the role without any salary, protected time, or even an office. In the absence of a directive, and with ongoing budgetary concerns, instituting full syndromic surveillance was not seen by most hospitals as necessary or feasible.

As well, hospitals were not able to access any baseline data on rates of similar respiratory infections prior to SARS. These baseline data would have been important in assessing whether the rates of respiratory illness being observed were unusually high. The corollary was that hospitals lacked established surveillance networks with real-time pooling of data and rapid expert analysis.

DISCUSSION POINT

Infection control programs in hospitals function as a parallel system to public health efforts in the community. Infection control practitioners are responsible for tracking and managing hospital-acquired infections, educating other health care workers, and reinforcing proper precautions. The Canadian Hospital Epidemiology Committee advises that systemic problems in our current health care system include "insufficient time devoted to learning infection control practices for all health care providers" and "little, if any, monitoring of infection control practices and few consequences for non-compliance." The high rates of transmission to health care workers during SARS indicated that many had "limited awareness of the correct precautions and/or how to apply them." A recent survey found that nearly 80% of Canadian hospitals do not meet the standard recommended by the Canadian Infection Control Alliance of one infection control practitioner per 175 beds. More than 60% of hospitals do not have an infection control director with advanced qualifications (an MD or PhD) in infectious diseases, medical microbiology, or infection control. Should Canada establish higher national standards for infection control within hospital? Should provinces be initiating and funding a major overhaul of hospital infection control capacity? How should we as a country confront the shortage in infection control practitioners and experts?

2F.2 North York General Hospital

On three separate occasions in April and May 2003, officials at North York General Hospital invited experts to investigate potential SARS cases. Those involved in adjudicating the cases were a 'who's who' of leaders in the fight against SARS. Investigations at North York at times involved prominent infectious disease specialists, Toronto Public Health physicians, Health Canada personnel, and visiting experts from the CDC. Assessment was repeatedly bedevilled by the lack of an 'epidemiologic link'—a connection between what, clinically, could be a patient with SARS and a source for his or her infection.

Between April 20 and May 7, three psychiatric patients developed pneumonia. All had been on the seventh floor of North York General Hospital. One had come back to hospital through the emergency department. He was placed in a waiting area with a mask, but paced constantly and, to the concern of the staff, frequently removed his mask. All three patients were isolated and managed as potential SARS cases, although no epidemiologic link to other cases could be identified. The assessment team had divergent views as to whether the clinical picture was consistent with SARS—but in the end, chiefly because there were no epidemiologic links to known SARS patients and negative laboratory tests, they ruled out a new cluster.

Meanwhile, unbeknownst to the hospital administration, several elderly patients on the orthopaedic ward (4 West) had been fighting what were at first believed to be typical post-operative lung infections. Among them was a 96-year-old man with a fractured hip. Through means still unknown, illness spread from 4 West over the next few weeks to other patients and to several visitors and staff. On April 29, an intensive care unit nurse from North York General was admitted to Toronto General Hospital with a respiratory illness. She had cared for an 88-year-old patient from 4 West who had been transferred to the North York ICU with fever, respiratory compromise, and confusion on April 26 and subsequently died. At first, the nurses' serology was negative for SARS, but test results later were positive. In hindsight, the 88-year-old was probably part of a growing SARS cluster on 4 West.

In mid-May physicians and nurses in the emergency department assessed family members of the 96-year-old man with symptoms suggestive of SARS, and they were increasingly anxious about a continuation of the outbreak. Radiologists also expressed concerns to colleagues about sets of suspicious x-rays. Taking their cue from public health officials and citing the epidemiologic uncertainty about how all these cases could be linked to each other, the hospital's infection control director and vice president of medical affairs tried to reassure emergency physicians and nurses at a tense meeting on May 20.

DISCUSSION POINT

During the SARS outbreak, Health Canada and Ontario posted divergent definitions for probable and suspect SARS cases. Both jurisdictions revised the definitions intermittently. Some critics argued that the Ontario definition put undue emphasis on close contact with a probable or suspect SARS case, leading to a focus on specific epidemiologic links and missed clusters of SARS. The definition was revised on May 26 after the second wave of SARS had begun. The new definition allowed for exposure to a health care setting with SARS patients, and no longer required evidence for close personal contact to label a suspect case. Critics of the Health Canada definition felt that it led to under-diagnosis of SARS by excluding cases if there was an alternative diagnosis for the relevant symptoms. On May 29, Health Canada's definition was revised to emphasize that the alternative diagnosis must "fully explain" the clinical picture. How should case definitions be constructed during infectious disease outbreaks? Did Canada have two definitions of SARS—one set by the federal government apparently based on F/P/T consensus, and another in Ontario where the outbreak was being fought?

Meanwhile, St. John's Rehabilitation Hospital had a steady flow of patients from other institutions, including a transfer from 4 West at North York General Hospital. During the third week of May, staff at St. John's informed senior management that three patients were exhibiting SARS-like symptoms, and a call went out to Toronto Public Health. The hospital immediately instituted all the appropriate precautions. Still chasing down 30 to 40 possible cases of SARS per day, personnel at Toronto Public Health agreed by telephone that there was a respiratory outbreak, but suggested that SARS was not the likely culprit—as at North York General Hospital, no epidemiologic link could be established. Toronto Public Health staff visited the hospital on May 22. Discussion again focused primarily on establishing an epidemiologic link to the patients. None was found.

2G. SARS II

(May 23, 2003 - June 30, 2003)

> *"SARS I was not avoidable. We were struck by lightning. Everything after that was."*
>
> *—Dr. Richard Schabas, Chief of Staff,*
> *York Central Hospital*

On May 23, barely one week after WHO had declared Toronto free of local transmission, health officials acknowledged that SARS had not been defeated. The province issued a press release announcing that five people were under investigation for SARS. Anyone who had visited St. John's between May 9 and 20 or North York General Hospital between May 13 and 23 was ordered into quarantine. North York General Hospital immediately closed its doors to all new admissions, except for SARS patients. By this time, SARS had already spread not only within North York General Hospital but also to patients who had been transferred from St. John's to the Toronto General site of the University Health Network, The Scarborough Hospital, General Division, and Baycrest Centre for Geriatric Care.

Despite extensive investigations by Toronto Public Health, Health Canada and the CDC, the exact chain of events leading to the second wave of the SARS outbreak remains a mystery. In fact, a definitive link between the first outbreak and the cases on the orthopaedic unit (4 West) has yet to be established, although officials have suggested different possibilities. How the psychiatric patients fit into the overall picture is also unknown, and may never be definitively solved.

With SARS II underway, all hospitals in the GTA were asked to resume previously abandoned infection-control procedures. Only four hospitals were designated as SARS facilities. (The comparative impact of this alternative approach to handling the SARS caseload is analyzed in Chapter 8.) These four hospitals were termed the SARS Alliance. North York General's medical staff and administration staff rallied and rapidly converted their institution into a major SARS centre. The General site of The Scarborough Hospital also geared up rapidly to take on a large caseload. St. Michael's Hospital gradually took on the mandate of managing complex SARS patients, consistent with its tertiary provider role. Sir William Osler Health Centre in Etobicoke faced the greatest challenge in organizing a SARS service, but ultimately provided west-end coverage for the Alliance.

The SAC reconvened. In the absence of the declaration of a general provincial emergency, the OMHLTC now took a lead role with local public health officials in coordinating the outbreak response. A SARS Operations Centre was set up in Ministry offices at 80 Grosvenor Street. Two assistant deputy ministers jointly oversaw the institutional and clinical liaison functions. Dr. Jim Young brought his considerable experience back to the table, and chaired many of the meetings of the new SARS executive group. A number of physicians and administrators, mindful of the experience with SARS I, urged that one person be given clear authority to be in charge of the outbreak, but the problem of multiple leaders recurred.

Meanwhile, public health officials began, once again, the meticulous work of interviewing patients and tracking down contacts. There was considerable fatigue and frustration on the front lines, but also some mitigating features. The outbreak was smaller, the virus was better understood, and the necessary precautions and routines were established. By the end of May, 48 probable and 25 suspect cases had been identified in the second outbreak. Again, transmission had been limited primarily to hospital patients, health care workers, and their families. Toronto was added back to the WHO list of areas with local transmission, but WHO did not issue a travel advisory against the city.

A Clinical Advisory Team working with the Ministry put out a call for volunteers in May, and a number of American infectious disease physicians and hospital epidemiologists offered to come to Toronto. Meanwhile, as noted above, the province retained a private health care personnel agency as sole-source provider of additional physicians and nurses for the involved institutions. Organized medicine was later critical of the contract, noting that Canadian physicians who had volunteered to help were channelled through the agency. Other informants shrugged off the criticism, pointing out that the agency was able to deliver qualified personnel in the face of a planning and process void.

As May turned into June, a few setbacks occurred. A medical student had been placed in quarantine after potential SARS exposure during an obstetrics rotation at North York General Hospital. Two days after his quarantine had expired, he developed symptoms while working in obstetrics at Mount Sinai Hospital. Five women and their newborns, as well as a number of staff, were quarantined. Another incident involved 1,700 students at a high school in Markham who were quarantined after a student at their school fell ill.

On June 10, largely because of the tangled chain of events at North York General Hospital, but also because of mounting pressure from nursing associations and unions, opposition politicians, and the media, the Province of Ontario announced a formal arm's-length investigation into the SARS crisis, headed by Ontario Superior Court Justice Archie Campbell.

2H. SARS and the Health Care Worker

On June 30, Nelia Laroza, a 51-year-old nurse at North York General Hospital became the first Canadian health care worker to die from SARS. Hundreds of friends and colleagues, along with the Premier of Ontario and the Minister of Health and Long-Term Care, gathered at St. Michael's Cathedral to pay tribute. A second nurse, Tecla Lin, died on July 19, and a family physician, Nestor Santiaga Yanga, died on August 13.

Perhaps no segment of society was hit harder during the outbreak than health care workers, a group that accounted for over 40% of SARS infections in the Toronto outbreak. For many, the knowledge that SARS patients included colleagues and friends was a source of considerable stress and anxiety. And for those who were afflicted, the memories are intense. In the words of one health care professional hospitalized for three weeks with SARS, "I was forced at once to confront the fact that I might not survive the infection...I was stepping into uncharted waters, a most unnerving adventure."

At focus groups convened for the Committee, nurses and support staff expressed frustration with communication delays, impractical or unrealistic directives, and the inconsistent application of rewards and incentives for those working in high-risk situations. Hospital employees described a wide range of feelings—including fear, anger, guilt, and confusion—as they struggled with personal risks, social isolation, and stigmatization of their families. While most also noted a heightened sense of pride, teamwork, and solidarity, others experienced post-traumatic stress disorder, and a minority felt they needed to change careers.

Nurses have long voiced concerns that their knowledge and experience is not taken seriously by senior decision makers. At North York General Hospital, nurses alleged that administrators ignored their warnings of an impending second SARS outbreak. Nurses also expressed concerns that the SARS unit at North York General Hospital was overloaded, and that suspect cases were being treated in the emergency department with only curtains for isolation. It may not be a coincidence that North York nurses lacked a key advocate—the position of Chief Nursing Officer lay vacant throughout most of the SARS outbreak. At the same time, the political polarization around SARS has left lasting scars in other ways. A hospital administrator who led a successful SARS team later lamented the mass grievance campaigns launched by organized nursing in Ontario to protest special rewards for nurses working in SARS units: "It was like being in a war and having your own soldiers shooting at you."

DISCUSSION POINT

SARS has provoked welcome discussion of the occupational culture in health care. Notwithstanding popular perceptions, it appears there was only one case of inter-institutional transmission of SARS by a part-time worker moving between facilities. But casualization has other downsides, including attenuation of a sense of workplace community and a reduced awareness of infection control protocols, both essential for front-line workers faced with an outbreak such as SARS. The Canadian Hospital Epidemiology Committee also notes that hourly pay for casual staff offers them an incentive to work while ill—a practice that, post-SARS, health care facilities have actively discouraged.

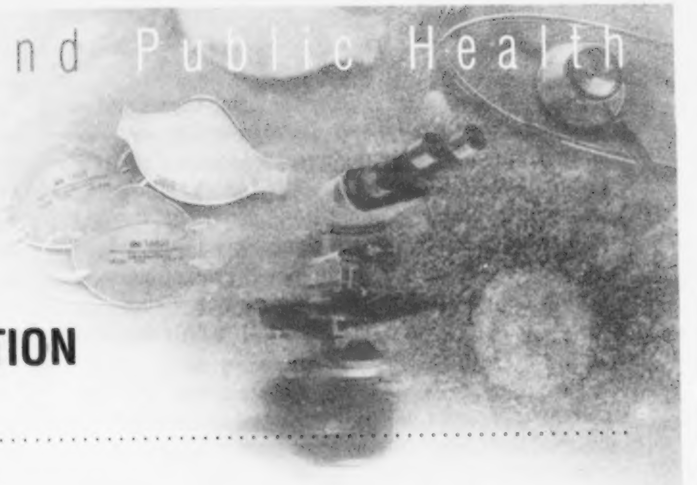
Countless health care workers faced a fundamental conflict between self-preservation, and a professional obligation to serve the greater good. Only a small number refused to treat SARS patients or work on SARS wards. Most willingly volunteered, putting their health—and potentially the health of their families—in jeopardy. Unlike other risks in the clinical setting, such as transmission of HIV or hepatitis from accidental skin punctures, SARS was acute in onset, carried an immediate mortality risk, and had no specific treatment. Perhaps more importantly, it could be transmitted to a health care worker's children by a goodnight kiss. Hundreds of health care workers isolated themselves from their families during the outbreak, wearing masks at home, sleeping in the basement, taking meals alone, and waiting to see if they would develop tell-tale symptoms. The Committee would like to salute each and every one of them for their courage and commitment.

21. Epilogue

> *"In our drive to technology in the 1980s and 1990s, we forgot the basics."*
>
> *—Dr. Bill Sibbald, Physician in Chief, Sunnybrook and Women's.*

We were fortunate that the SARS virus is biologically handicapped. At least in the vast majority of cases, it requires prolonged, close contact to make the short jump from one human being to another. SARS has been contained, at least temporarily—not by the genomic revolution, not by advanced pharmaceuticals, but by old-fashioned public health measures like hand washing, infection control procedures, isolation of cases, and tracing and quarantine of contacts.

What the SARS outbreak showed, perhaps more than anything else, is the power of public health. The best current evidence is that without effective public health measures, SARS would have eventually sickened millions of people on this shrinking planet, causing not hundreds of deaths, but countless thousands. The next outbreak, however, may be even more insidious than SARS. Canada may have to deal with a deadly airborne virus, or a virus transmitted via droplets but with such a long incubation period that quarantine would be worthless. Will we be ready?



Chapter 3

THE ROLE AND ORGANIZATION OF PUBLIC HEALTH

The preceding chapter set out a brief chronology of the SARS outbreak as it affected Canada. The SARS experience illustrated a variety of issues, some to do with the health services system, but many others to do with public health and the interface between public health and clinical care. Except in cases of sudden threats to the health of communities such as Walkerton, North Battleford, or SARS, public health operates in the background and is often taken for granted. Many Canadians—including health care professionals and administrators—accordingly have only a limited understanding of what public health is and how it is organized in Canada. This chapter provides an overview of the evolution of public health, its organization and funding in Canada, selected comparisons with other industrialized nations, and some preliminary thoughts on domestic directions for change.

3A. What is Public Health?

3A.1 The Origins of Public Health

More than two thousand years ago, the authors of Greek mythology had already drawn a distinction between curative medicine and prevention or health promotion. Asklepios, the Greek god of medicine, was reputed to have had two daughters, Hygiea—the goddess of prevention and wellness, and Panacea, the goddess of treatment. Other distant origins of public health surface in Greco-Roman writings associating different diseases with possible causes, together with prescriptions for their avoidance.

Canadians today sometimes confuse public health with publicly-funded health care. However, until the late nineteenth and twentieth centuries, personal health care was left for individuals to arrange. Threats to collective health, in contrast, have been taken up as a matter for community control or regulation wherever mechanisms of governance emerged. In Biblical times, for example, communities isolated those with leprosy as potential sources of contagion. Urbanization in medieval Europe lent momentum to concerns about sanitation and disease. The first English Sanitary Act was passed in 1388, dealing with offal, slaughterhouses, and "corrupting of the air". Around 1348, the Republic of Venice appointed three guardians of public health to detect and exclude ships with passengers affected by pneumonic plague (Black Death). In Marseilles (1377) and Venice (1403), travellers from plague-infected areas were detained for 40 days to protect against transmission of infection; this is the origin of the modern term *Quarantine*.

From the outset, public health practice has depended on health information, and information in turn presupposes the existence of surveillance systems and organized data. One such source of data was the "bills of mortality" established in London, England in 1532. More than a century after this system of death records was initiated, John Graunt published his *Natural and Political Observations made upon the Bills of Mortality* (1662), examining deaths in London by age, sex, district and social class. By 1766, the Austrian physician Johan Peter Frank had advocated a comprehensive system of health surveillance as part of his proposed "medical police". In 1790, Dr. Frank argued that curative and preventive measures had little impact on populations where people lived in abject poverty and squalor. This heralded a tradition of concern for living conditions and social justice that continues today in the public health ethos.

In 1842, England's Edwin Chadwick similarly described urban squalor, lack of sanitation, and over-crowding; and he related these to the incidence of disease and death, as well as contrasting life expectancy in different social classes. His work heralded the beginning of the *sanitary movement in Britain*. The motives behind the sanitary movement were mixed as were the arguments for it by public health proponents. Some claimed that a more egalitarian society would be healthier and fairer. Others pointed out the need for healthy labouring classes and soldiers, and the threat of both social instability and contagion spreading from the teeming industrial slums of Europe. By 1850, Lemuel Shattuck's "Report of the Massachusetts Sanitary Commission" also related living conditions to infant and maternal mortality and morbidity rates. As the sanitary movement spread, communities implemented proper disposal of waste, urban sewage systems, and supplies of pure water for all, with a dramatic improvement in population health.

The tool-kit of public health practice still had few individual-level interventions apart from measures such as vaccination against smallpox. Nonetheless, the science and information supporting public health was improving steadily. In England William Farr started to develop the General Registry Office in 1836, building on the introduction of a national census in 1801 by classifying causes of death. Formal medical certification of death and universal death registration commenced in England and Wales a year later. John Snow—the "father of epidemiology"—published his *On the Mode of Communication of Cholera* in 1849, famously removing the handle of the contaminated Broad Street pump from whence cholera was spreading. Snow's action was a landmark in public health intervention to contain a disease outbreak. A critical step forward occurred in 1856 when Louis Pasteur published his observations on the germ theory, allowing microbiology to advance rapidly. In 1867, Koch published his famous postulates for establishing a causal connection between a specific microbe and a disease. Such connecting threads in public health thinking have proven durable: only weeks before release of the present report, *The Lancet* published an article by Kuiken et al arguing that the novel SARS-associated coronavirus satisfies a modernized version of Koch's postulates.[1]

In this country, Lower Canada established a Board of Health in 1832; Upper Canada followed suit a year later. Ontario passed the first provincial public health act in Canada in 1884, and other provinces soon passed similar legislation. These acts provided for the establishment of local boards of health with the authority to remedy hazards to health and to appoint medical officers of health. In these early years, boards often hired medical officers of health only when a disease outbreak struck, and dismissed them once the danger was over. Local boards of health were heavily involved in the mid-nineteenth century with quarantine and immunization as well as combating a series of epidemics of smallpox and cholera.

As medical science evolved, and local boards of health provided infrastructure for implementing inspection and regulation, local public health units in Canada took on other activities. These included pasteurization of milk, tuberculin testing of cows, oversight of isolation to contain spread of tuberculosis [TB], management of TB sanatoria, quarantine for diverse conditions, and the control of sexually transmitted diseases. The early twentieth century brought an increasing emphasis on maternal and child health. Public health physicians and nurses took a leading role in developing immunization clinics, well baby clinics, prenatal classes, postnatal visits, and education on parenting and childhood nutrition.

The activism of public health in individual- and family-level interventions was not without occasional territorial tensions. Some general practitioners voiced complaints that these salaried and subsidized personnel were taking away their livelihoods and interfering with the development of family-based practices. The First World War nonetheless saw a blush of enthusiasm for public health and the integration of preventive medicine into clinical practice. In 1919, the Government of Canada brought together several pieces of legislation pertaining to food, drugs and control of infectious diseases, and established a national Department of Health. This was the same year that the Liberal Party cautiously adopted national health insurance as a plank in its platform, and the British Columbia Social Welfare Commission began exploring the feasibility of a state-sponsored health insurance scheme.[2] But while Medicare was several decades away, public health measures were already well-established across Canada.

Following the Great War, mainstream medicine still had few specific remedies to palliate or cure disease. Surgical techniques were crude, and drugs limited to a handful of compounds such as digitalis for congestive heart failure, quinine for malaria, and arsenicals for syphilis. Insulin would not appear on the clinical scene until 1923. Public health, meanwhile, was progressing steadily. Toxoids were a key breakthrough in immunization strategies; a toxoid is a bacterial toxin treated to render it harmless but still capable of inducing immunity to the disease. On into the mid-1920s, diphtheria was the leading cause of death among children. The widespread use of antitoxin had only a minor impact on the incidence of the disease. After the discovery of diphtheria toxoid, the Connaught Laboratories in Toronto produced toxoid on a massive scale and proved its effectiveness with massive field trials of childhood immunization in Ontario starting in 1926. The same period saw pertussis toxoid introduced for case contacts and epidemics. Tetanus toxoid and a string of other triumphs for immunization and vaccination—most notably the introduction of an effective vaccine for polio by Jonas Salk in 1956 and the eradication of smallpox—followed later.

Notwithstanding these triumphs, indeed perhaps in part because of them, public health was moving into a background role. The growing effectiveness and technological sophistication of clinical medicine captured the public imagination. After insulin came sulpha drugs and penicillin, and then a massive armamentarium of antibiotics, including treatments for tuberculosis. Surgical and related techniques blossomed. Open heart surgery, dialysis, joint replacement, pacemakers, kidney transplantation—these and other innovations featured prominently in the mass media of the 1950s and 1960s. Their marginal yields at a population level were meaningful but relatively small. Increasing societal prosperity and enlightened social policy accompanying economic growth were great catalysts for overall improvements in life expectancy. Across all industrialized nations, public health interventions also helped drive communicable diseases down the mortality lists through the middle and latter parts of the twentieth century.

Public health, as we have already seen, was not solely about control of infectious diseases. Pioneers of public health in the eighteenth and nineteenth centuries investigated the causes of, and advocated action against, nutritional (scurvy), occupational (cancer of the scrotum), and environmental (lead poisoning) diseases, and urged measures to limit inequalities in health across education and income levels. Public health practitioners remained at the forefront throughout the twentieth century in championing legislative and regulatory initiatives to reduce the burden of premature and avoidable deaths and injuries along with preventable diseases.

Nonetheless, the shift in mortality and morbidity profiles away from communicable diseases to chronic non-communicable diseases created challenges for public health practice. Coronary heart disease [CHD] is a useful example. The decline in incidence of CHD in Canada is unequivocal. The decline antedates introduction and widespread adoption of effective agents for treatment of dyslipidemias (e.g., high cholesterol), and the impact of improvements in physical activity profiles is uncertain. Some of the decline appears to be attributable to smoking cessation and adoption of healthier diets. To what can we attribute changes in those risk factors? Family physicians and other clinicians are actively engaged in counselling against smoking, and provide pharmaceutical supports to facilitate smoking cessation, but public health policy and education have also played a role through tobacco taxes, anti-smoking advertising campaigns, production of education materials, and product labelling. Various stakeholders from different levels of governments to the Heart and Stroke Foundation are active in encouraging smoking cessation and promoting the adoption of healthier diets. Public health researchers unquestionably helped generate the epidemiologic evidence that linked CHD to these risk factors. But even for a clear-cut case such as prevention of heart disease, the positive influence of public health has been as much indirect as direct. Similar challenges arise in delineating the role of public health in areas such as injury prevention or, *a fortiori*, interventions to redress the profound and persisting variations in health status across socioeconomic strata in Canadian society.

Not surprisingly, even within the public health community, debates occur between those with more or less expansive views of the mandate of public health. But there is little disagreement on two points. First, existing levels—and allocations—of resources are suboptimal to permit the deployment of many interventions that have the potential to avoid premature death or disability. Second, public health has essential roles in areas such as health protection (food and water safety), disease surveillance, and outbreak management, and these functions must be given priority. As we have seen with SARS, questions now exist as to whether the Canadian public health system is minimally equipped and organized to deal with even a modest-sized outbreak of a new communicable disease.

In sum, for about a century and a half in Canada, there has been an organized public health presence, often little noticed, but nevertheless contributing to a steadily increasing life expectancy and quality of life for Canadians. Various analyses of the improvements in health during the twentieth century have highlighted that modern clinical medicine is important, but broad social changes and public health measures deserve the lion's share of the credit for the 25-year increase in life expectancy across industrialized nations, including the dramatic reduction of infant mortality from 20% to less than 1% in most developed countries.[3] Influential social and economic changes have included smaller families, higher standards of living with better nutrition, and adequate housing. However, public health has played a huge role in securing safe food and water supplies, implementing pasteurization, and developing and delivering programs of vaccination and immunization. The re-emergence of infectious diseases, and the continued scope for prevention of the now dominant non-communicable diseases, both suggest that the yields of prudent new investments in public health may be substantial.

3A.2 Defining Modern Public Health Practice

Public health developed over the centuries as society's response to threats to the collective health of its citizens, and has an enviable record of contributions to population health status. How do we define public health practice today?

Public health can be described as the science and art of promoting health, preventing disease, prolonging life and improving quality of life through the organized efforts of society.[4] As such, public health combines sciences, skills, and beliefs directed to the maintenance and improvement of the health of all people through collective action. The programs, services, and institutions involved tend to emphasize two things: the prevention of disease, and the health needs of the population as a whole.[5] This population focus distinguishes public health from the clinical enterprise that is governed by the Hippocratic imperative with its focus on the individual patient. Indeed, delineation of the boundaries of public health in this regard has been made explicit in Quebec's 2001 *Public Health Act*, viz: "Public health actions must be directed at protecting, maintaining or enhancing the health status and well-being of the general population and shall not focus on individuals except insofar as such actions are taken for the benefit of the community as a whole or a group of individuals."[6]

This collective approach means that, as even the brief history above has illustrated, public health has long included a regulatory function. Regulation is an effective means of protecting the public from a variety of hazards, including carriers of infectious diseases, food, drugs, consumer products, pesticides, improper waste disposal, impure drinking water, recreational water, dangerous motor vehicles, unsafe workplaces, second-hand smoke, and many others. In Canada, all levels of government—federal, provincial/territorial, and municipal—are involved in the regulatory functions of public health.

The logic of a collective or population-based approach to traditional public health measures, such as communicable disease control, is self-evident. But a population approach can also be efficient in dealing with non-communicable disease prevention. As Geoffrey Rose[7] has argued, risk factors for most diseases are typically distributed across a continuum. A preventive strategy focusing on high-risk individuals will deal with the margin of the problem, and has only a trivial impact on the large proportion of disease occurring in the majority of people who are at moderate risk. For example, the number of cardiovascular events arising in people with slightly raised blood pressure or moderately abnormal blood lipids greatly exceeds those arising in the clinically hypertensive or dyslipidemic minority. Population-based strategies that seek to shift the whole distribution of risk factors have the potential to exert a much larger impact at a population level.

However, a preventive measure that brings large benefits to the community may offer little to each participating individual—this is Rose's 'prevention paradox'. Changing health habits through individual intervention can be difficult and inefficient; and the gradual adoption of new norms (e.g., in diet and exercise) becomes the logical way forward. At the same time, ethical concerns dictate that clinicians seek out and offer individualized treatment to the small minority of persons at greatly elevated risk. The population approach of public health and the individualized approach of clinical medicine are thus complementary: the opportunities for each will vary according to the disease and risk factor, and what interventions are available. Finding the right balance is important.

When the task of disease prevention and health promotion moves away from precisely identifiable risk factors, matters become even more complex. The health of populations and individuals is obviously shaped by a wide range of factors in the social, economic, natural, built, and political environments. These factors interact with each other and with innate individual traits such as genetics, sex, and age. As researchers have delineated the complex webs of causation that influence health-related behaviours and health status, they have articulated a *population health* approach that highlights the need for interventions such as regulation, education, community development and social policy. The extent to which particular public health units or professionals embrace these tools varies, but the population health framework has usefully integrated analytical perspectives in the public health field.

Public health practice relies heavily on intersectoral partnerships. Public health professionals must be able to work with a range of disciplines, and form coalitions to advocate for mitigation of health risks or implement health-enhancing changes in various environments. The voluntary sector is a key partner in public health today. This includes non-governmental agencies (such as health charities and professional associations), local associations of all kinds, community development groups, recreational associations, business groups, organized labour and other workplace collectivities, together with the governmental structures which partly support and fund them. These groups may be overtly health-oriented, or may have primary interests in related areas such as child development and social welfare. In Canada, the voluntary sector partners with local health agencies, as well as federal and provincial/territorial [P/T] governments in various programs. Joint activities include health promotion initiatives, and the provision of services, advocacy and community development. These participatory approaches are particularly important for Aboriginal populations and other marginalized or hard-to-reach groups.

Over the past decade, many countries have tried to define the essential functions of their public health systems. In Canada, no single accepted list exists, although a report of the national Advisory Committee on Population Health (ACPH) recently recommended the following list of essential functions:

- **Health Protection.** This is a long-standing core function for all public health systems. The assurance of safe food and water, the regulatory framework for control of infectious diseases, and protection from environmental threats are essential to the Public Health mandate and form much of the body of current public health legislation worldwide. Included in this function is the provision of expert advice to national regulators of food and drug safety.
- **Health Surveillance** allows for early recognition of outbreaks, disease trends, health factors, and cases of illness which in turn allows for earlier intervention and lessened impact. Surveillance also assists in our understanding of the impacts of efforts to improve health and reduce the impact of disease. For example, a new strain of Salmonella occurring in many parts of the country over a short period of time may indicate contamination of a widely-distributed food product.
- **Disease and Injury Prevention.** More than a decade ago, the Centers for Disease Control and Prevention in the USA identified that as much as two-thirds of premature mortality was preventable through the application of available knowledge. Many illnesses can either be prevented or delayed and injuries can be avoided (e.g., bicycle helmet use). This category of activity also includes investigation, contact tracing and preventive measures targeted at reducing risks of outbreaks of infectious disease. It overlaps with health promotion, especially as regards educational programs targeting safer and healthier lifestyles.
- **Population Health Assessment** entails the ability to understand the health of populations, the factors which underlie good health and those which create health risks. These assessments lead to better services and policies.
- **Health Promotion.** Public health practitioners work with individuals, agencies, and communities to understand and improve health through healthy public policy, community-based interventions, and public participation. Health promotion contributes to and shades into disease prevention (see below) by catalyzing healthier and safer behaviours. Comprehensive approaches to health promotion may involve community development or policy advocacy and action regarding the environmental and socioeconomic determinants of health and illness.*

The Canadian Institutes of Health Research's [CIHR] Institute of Population and Public Health recently led a group of opinion leaders through a process to consider the future of Public Health, and identified some examples for each of these functions delineated in Table 1.

Last, public health also plays a key role in **Disaster Response**. Many natural disasters not only place immediate demands on the health care system, but may involve secondary threats to population health through contamination of food or water supplies or communicable disease outbreaks.

3B. Governance and Organization of Public Health in Canada

3B.1 Some Constitutional and Legislative Issues

Chapter 9 provides a more detailed treatment of constitutional and legislative issues. This introductory overview offers some general context.

Canada's *Constitution Act* (formerly the British North America Act of 1867) outlines the division of responsibilities between provinces and the federal government, and was created at a time when infectious disease and other public health concerns were everyday realities. The Act assigned responsibility for "quarantine and the establishment of marine hospitals" to the federal government, and (s. 92) the "establishment, maintenance and management of hospitals, asylums, and eleemosynary institutions in and for the province, other than marine hospitals" to the provinces.

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* The more expansive aspects of health promotion occasionally draw criticism as forms of 'health imperialism' or 'social engineering'.

TABLE 1

Examples of Programming for Essential Public Health Functions.

Essential Function	Programming Examples
Population health Assessment	• Population/community health needs assessment; • Health status report, system report card.
Health surveillance	• Periodic health surveys; • Cancer and other disease registries; • Communicable disease reporting; • Ongoing analysis of data to identify trends or emerging problems, (e.g., recognition of increasing syphilis cases); • Report to practitioners of increasing threat, what they need to look for, and intervention required.
Health promotion	• Intersectoral community partnerships to solve health problems; • Advocacy for healthy public policies; • Catalyzing the creation of physical and social environments to support health (e.g., bike paths, promoting access to social networks for institutionalized seniors).
Disease and injury prevention	• Immunizations; • Investigation and outbreak control; • Encouraging healthy behaviours (e.g., not smoking, healthy eating, physical activity, bicycle helmet use); • Early detection of cancers (e.g., organized programs for breast cancer screening).
Health protection	• Restaurant inspections; • Child care facility inspections; • Water treatment monitoring; • Air quality monitoring/enforcement.

Sections 92(13) and 92(16) of the Constitution give provinces responsibility, respectively, for property and civil rights and for matters of a local or private nature. Both are relevant to the primary authority that provincial governments claim in Canada to pass legislation concerning public health. Federal authority in public health derives from federal powers in diverse areas, such as the criminal law, matters of national concern as regards "peace, order, and good government", quarantine and national borders, regulation of interprovincial trade and commerce, and international treaty-making. Jurisdiction, in short, is mixed.

In Canada, there are federal legislative provisions for the regulation of food, drugs, and pesticides. The titles of the *Quarantine Act* and the *Importation of Human Pathogens Regulations* of the *Department of Health Act* are self-explanatory, and these laws flow logically from the constitutional division of powers. The *Canada Health Act* sets out the conditions for receipt of funding for physician and hospital services, but does not cover public health. Indeed, only the *Department of Health Act* offers a broader public health mandate, and, apart from the above-noted regulations, its wording is more permissive than prescriptive. It states that the Minister of Health is responsible for "the promotion of the physical, mental and social well-being of the people of Canada, the protection of the people of Canada against risks to health and the spreading of diseases, and the investigation and research into public health, including the monitoring of diseases."

The uncertainty about federal powers in public health is underscored by the state of disease surveillance. While the *Statistics Act* and the *Department of Health Act* provide the Government of Canada with a mandate to collect information on public health risks of a pan-Canadian nature, Health Canada does not currently have a clear legal mandate to require provinces/territories to share health surveillance data with each other and the federal government. As was evident in the SARS outbreak, these transfers occur voluntarily.[8]

For the federal government to exert a stronger coordinating and supporting role, one logical avenue is through the use of federal spending power. That is, the federal government can involve itself in public health by providing conditional funding for public health programs or by entering into legal contracts to develop public health initiatives. The Population and Public Health Branch of Health Canada currently exerts only a limited steering effect through its program of grants and contributions. These grants and contributions are not directed to other levels of government, but to non-profit and non-governmental organizations. They target areas such as children's health, Aboriginal peoples' health, diabetes, HIV/AIDS, Hepatitis C, and tobacco control, among others. There is no legislative provision per se for Health Canada's role in these programs. Rather, they are established under the broad rubric of the Minister of Health's authorities in the *Department of Health Act*, and funded following Cabinet and Treasury Board decisions on policy and funding respectively.

Public health activities in each province and territory are governed by a public health act (or equivalent) and its regulations, as well as by other specific legislation (e.g., Ontario's *Immunization of School Pupils Act*). Some public health acts are decades old. Ontario (1983), Saskatchewan (1994), and Quebec (2002) all have modernized legislation, and British Columbia proposes to introduce a new act soon. The older acts tend to be mainly concerned with infectious diseases and specific in the powers given to public health officials, while the newer acts are more flexible. All public health acts have regulations; these vary from province to province. The planning and delivery of services is mostly devolved to regional/local structures, with responsibility usually assumed by elected and/or appointed boards.

Environmental health illustrates the potential jurisdictional ambiguities. The federal and P/T governments all have legislation bearing on environmental health issues. P/T environment ministries may operate water purification facilities and test water. Municipal governments may pass by-laws, provide many environmental services, and be involved in enforcement. Local public health agencies and/or P/T health ministries are responsible for advising on human health impacts of environmental problems, for undertaking inspections and enforcement, and for investigations of environmental health hazards and health events thought to be environmentally caused. Public health laboratories undertake some testing, as also do various federal, provincial, university or contract laboratories. Other departments of governments such as natural resources, transportation and recreation are inevitably involved. Lastly, emergency preparedness and response authorities, including P/T ministries of public security, will be involved in responding to environmental disasters.

3B.2 Organization of Public Health Services

The situation of primary responsibility for public health services at the municipal or local level is rooted in a tradition that dates back to the time of Elizabeth I. In Canada, primary legislative authority seems to rest with the provinces and territories, but local public health remains the front line for battling outbreaks such as SARS. The following overview accordingly moves from the local to P/T to federal levels.

There are four patterns of governance of local public health services in Canada.

- **Regional Health Authorities/Districts**

  This is the most common pattern, especially in the West and increasingly in the Maritimes. Elected and/or appointed boards are responsible for the provision of health services within a defined geographical area. The governance for public health is thus combined with that for other health services. The boards are either elected by local residents, or appointed by the provincial government, or a mixture of both. The system is a product of the 1990s and still evolving: for example, the number of regions and their boundaries change frequently, there is sometimes tension between boards and provinces concerning powers, and there has been a swing away from elected to appointed members. Despite the instability of these arrangements, they have the major advantage of promoting the integration of clinical and public health services under unified governance that is locally responsive to some degree. Regional structures, however, have not solved the problem of under-investment in public health.

- **Regional/District Boards**

  In this case, the boards are responsible for public health and/or other community-based services within an area, but do not have oversight of publicly-funded personal health services. This is the pattern in parts of Newfoundland, and until recently, in New Brunswick.

- **Quasi-municipal/County**

  This is the earliest pattern, and continues in Ontario. Local boards are responsible for public health and some other community services. Boards serve either single or multiple municipalities and counties, and are appointed by the involved municipalities and the province. In large cities, the public health board is usually a committee of city council.

- **Provincial**

  In Prince Edward Island, services are delivered at the provincial level.

Health Canada, through the First Nations and Inuit Health Branch [FNIHB], has a mandate from the federal parliament to provide certain public health services to First Nations communities on reserve. Communities with "transfer arrangements" with FNIHB have taken on responsibility for some or most health services which would otherwise be delivered by the federal government, i.e., public health services may be delivered by the communities themselves. These arrangements are supported through contribution funding provided by the federal government.

Local service delivery across Canada is through the health departments of regional health authorities or districts, or (in Ontario) through health units and municipal health departments. The populations served by the relevant units range from 600 to 2.4 million people, with catchment areas from 4 square kilometres to 800,000 square kilometres. There are approximately 139 such local/regional agencies serving urban, rural and isolated areas, covering the population of Canada, exclusive of some Aboriginal communities.

Each local/regional public health agency has a position for a medical officer of health [MOH] - a licensed physician with post-graduate training in public health. Smaller health units find it difficult to attract medical officers of health or provide the full range of services. In Saskatchewan, partly for this reason, adjacent districts have arranged to share either the medical officer of health or the entire public health agency.

Each province or territory has a chief medical officer of health [CMOH] or equivalent. The CMOH may also be the director of the public health branch of the P/T government, or these may be separate positions. The senior public health physician sometimes also holds an Assistant Deputy Minister position. In Quebec, the Assistant Deputy Minister for public health by law is a physician with a specialist qualification in community medicine. The reporting relationships of the CMOH within the P/T governments vary considerably, as provinces have balanced a desire to ensure the independence of the CMOH as a health advocate with the need to integrate his or her portfolio into ministries of health.

Each province and territory also has public health staff within the provincial government. These staff typically engage in planning, administering budgets, advising on programs, and providing assistance to local staff for serious incidents. The British Columbia Centre for Disease Control [BC CDC] was established in 1997 to take responsibility for provincial-level management of infectious disease prevention and control, including laboratories. Division directors and other key scientific and medical staff in the BC CDC hold appointments at the University of British Columbia, and have protected time to enable academic activities. A specific effort is made to ground practices in research evidence. The BC CDC's budget flows through the provincial Health Services Authority.

Quebec established the National Public Health Institute in 1998 by transferring in staff from several regional public health departments and the ministry; it oversees the main public health laboratories and centres of expertise. Unlike the BC CDC, it has a general mandate that covers prevention, community development and health promotion, healthy living, workplace health, and chronic disease as well as infectious diseases. The Institute includes the Quebec Toxicology Centre, the Screening Expertise Centre, and the Poison Control Centre.

Many provinces have taken steps to ensure that the local administration of public health is not compromised by special interests and that provincial standards are upheld. These can be summarized as follows:

- Delivery of certain programs and services may be required for the province to flow funds to the local health unit. There may be lists of core or mandatory programs, together with a monitoring mechanism, with or without accompanying regulations. Nevertheless, the level of service provision varies both between and within provinces/territories.

- The chief medical officer of health may have the power to intervene anywhere in the province in an emergency.
- Medical officers of health at the local level may be provincial employees, reporting formally to the chief medical officer of health.
- Local boards of health may require the consent of the minister to hire and/or fire medical officers of health.
- The Minister of Health generally has the power to dismiss local boards of health.

At the federal level, the most relevant organization vis-à-vis public health is the Population and Public Health Branch [PPHB] of Health Canada. The Branch is headquartered in Ottawa, and has regional offices across Canada. Its components include Centres for Infectious Disease Prevention and Control, Chronic Disease Prevention and Control, Emergency Preparedness and Response, Surveillance Coordination, and Healthy Human Development. PPHB has oversight of the National Microbiology Laboratory in Winnipeg and the Laboratory for Foodborne Zoonoses in Guelph. Other branches in Health Canada, particularly the Health Products and Food Branch and the Healthy Environments and Consumer Safety Branch interact with local public health to a lesser extent. Federal agencies such as the Canadian Food Inspection Agency [CFIA] also have a role in public health.

In sum, the provincial/territorial presence predominates in public health, with most of the delivery of services occurring locally or regionally. The local/regional agencies have their own governance, but their activities are constrained by P/T law, regulations, policies, directives and conditions of funding. Various federal/provincial/territorial committees provide some elements of national coordination. These include the Advisory Committee on Population Health and Health Security reporting to the Conference of Deputy Ministers of Health, the Council of Chief Medical Officers of Health, the Canadian Public Health Laboratory Network, and many more technical groups. Domestically, the federal role, apart from specific areas of jurisdiction set out above such as quarantine at national borders or regulation of food and drugs, has been to support P/Ts and non-governmental organizations with technical advice, expert resources, advanced laboratory technology, and national surveillance and statistics. The federal government also funds research relevant to public health through various channels, including the CIHR and PPHB. Last, the federal government has a lead role in international liaison, as will be discussed in Chapter 11.

3B.3 The Challenge of Public Health in Rural and Remote Areas

As noted earlier, Canada was fortunate that SARS struck primarily in Toronto with its comparatively well-developed public health and health care infrastructure. In many parts of the country, capacity to battle public health threats is limited. The risk of communicable diseases, of course, is also contained by the low population density of these same areas.

Canada's northern territories, for example, comprise 0.3% of Canada's overall population, but 39% of its geographic area. In the far north, average life expectancies are lower than for the rest of Canada, owing to higher infant mortality rates in Nunavut and the Northwest Territories, higher lung cancer mortality rates in all three territories, and substantially higher rates of death from unintentional injuries and suicide. The territories have higher rates of infectious diseases such as tuberculosis and *Chlamydia*, higher teen birth rates, and greater incidences of smoking and other forms of substance abuse.

More generally, populations residing outside of large urban centres tend to have lower levels of education, employment, and income. Small local hospitals cannot maintain infection control with highly specialized staff as occurs in many urban hospitals. Rural hospitals seldom have rooms with respiratory isolation facilities. And in local public health units, staff multi-task as a matter of course. Public health nurses provide well baby and immunization coverage one day, community development and school visits the next. Similarly, public health inspectors deal with issues ranging across water safety, restaurant and event inspections for food safety, potential rabies exposures, enteric disease outbreaks, and environmental hazards. In these settings, no function can be abandoned to combat an outbreak for more than a few days without introducing new hazards. Most of these remote areas have a medical officer of health, but some positions go unfilled and others are managed by part-time clinical physicians. Public health inspector positions remain unfilled for long periods, and few smaller health units can afford to hire personnel with graduate training in areas such as health promotion or epidemiology. In short, Canadian geography poses special challenges in the organization and delivery of public health services.

3C. Public Health in the Background

We have seen that public health moved to the background as the technological capacity of clinical medicine grew through the latter half of the twentieth century. In parallel, Canada moved to organize universal prepayment of physicians' services and hospital care, initiating four decades in which funding of personal health services has taken ever greater priority over public health. Writing in the Royal Commission report that laid the foundations for Canada's universal medical care insurance system, Mr. Justice Emmett Hall and his fellow commissioners focused on plans to improve access to physician services, and offered only a passing reference to public health: "The efforts to improve the quality and availability of health services must be supplemented by a wide range of other measures concerned with such matters as housing, nutrition, cigarette smoking, water and air pollution, motor vehicle and other accidents, alcoholism and drug addiction."

In 1974, then Health Minister Marc Lalonde published an influential volume entitled *A New Perspective on the Health of Canadians*.[9] Lalonde argued that health status was influenced not only by health services and genetics or biology, but also by environmental and lifestyle factors. While the "New Perspective" drew positive national and international responses, its legacy was clouded on two scores. First, by highlighting the limits to health care based on broad population health trends and aggregate mortality statistics, the volume understated the value of clinical services for relevant outcomes such as disease-specific mortality, function, and quality of life. In part, it re-opened the unhelpful divide between advocates of more clinical spending and champions of public and population health. Second, the 'lifestyle' terminology, with its emphasis on personal choices, was characterized by some critics as "victim-blaming" because it downplayed the social roots of unhealthy behaviours at the individual level. The "New Perspective" did lend momentum to health promotion efforts, presaged the need for intersectoral collaboration in public health, and foreshadowed the population health paradigm that now holds sway. However, it appears to have had little lasting effect on federal or provincial spending in public health.

Throughout the latter half of the 1980s, when economic recession was coupled with escalating health care costs, most provinces and territories published reviews of health and health care. Nearly all of these reports shared two recommendations: improved control over resources, through processes such as integration of services, alignment of incentives, regionalization, and utilization management; and an increased emphasis on prevention and health promotion. In every province, the first set of recommendations was operationalized; the latter received much less attention.

The scope and importance of the HIV pandemic became increasingly evident during the 1980s, sparking world-wide concern about infectious diseases. An expert panel of the US Institute of Medicine conducted an 18-month study, culminating in 1992 in a major report—*Emerging Infections: Microbial Threats to Health in the United States*.[10] Health Canada's Laboratory Centre for Disease Control (later restructured inside the Population and Public Health Branch of Health Canada) also organized an Expert Working Group on Emerging Infectious Disease Issues. A multi-disciplinary group of 40 researchers and practitioners met at Lac Tremblant from December 7-9, 1993, producing a declaration whose opening sentences were prophetic:

> *"The HIV pandemic has demonstrated that the world is rapidly becoming a global community. Global interdependence, massive internal and external population movements, rapid transportation, increasing trade and changing social and cultural patterns expose large populations to new and different pathogens and pose new threats to their health and well-being. National boundaries no longer offer isolation or protection from infectious diseases, toxic chemicals and hazardous products."*

In its long list of recommendations, the group called for "a national strategy for surveillance and control of emerging and resurgent infections," support and enhancement of "the public health infrastructure necessary for surveillance, rapid laboratory diagnosis and timely interventions for emerging and resurgent infections," coordination and collaboration in "setting a national research agenda for emerging and resurgent infections," "a national vaccine strategy," "a centralized electronic laboratory reporting system to monitor human and non-human infections," and strengthening "the capacity and flexibility to investigate outbreaks of potential emerging and resurgent infections in Canada."

Little action was taken apart from some organizational changes, and most of the Working Group's recommendations from 1993 remain entirely valid a decade later. Indeed, we essentially recapitulate many of them in this report.

Mr. Justice Horace Krever provided a more general call to action in his 1998 report of the "Commission of Inquiry on the Blood System in Canada." Krever wrote: "Public health departments in many parts of Canada do not have sufficient resources to carry out their duties...Continued chronic under-funding of public health departments is a disservice to the Canadian public...It is recommended that the provincial and territorial ministers of health provide sufficient resources for public health services."[11] Krever made specific reference to the need for better surveillance for infectious diseases, not least those that had contaminated the blood supply.

On September 11, 2000, the provincial premiers and federal government reached an agreement on new funding for health care. This agreement provided $23.4 billion in additional funds over a six-year period (from 2000-01 to 2005-06) as set out in Table 2. There was no earmarked funding for public health infrastructure, although funds from the Canada Health and Social Transfer [CHST] could, of course, be directed to public health by the provinces.

At the provincial level, recent reports have begun to highlight the need for specific investments in public health. For example, in June 2000, the Quebec government created the Commission d'étude sur les services de santé et les services sociaux. The Quebec report defines the health system broadly, encompassing services to individuals, public programs aimed at prevention, and social policies aimed at improving health and welfare.[12] Of 36 recommendations, the first is "That prevention be the central element of a Quebec health and welfare policy." The report explicitly integrates recommendations about public health and preventive services with those focused on personal health and social services. *Healthier Together: A Strategic Health Plan for Newfoundland and Labrador* was released in September 2002 and focuses extensively on a population approach to health.[13] The report outlines only three broad goals. The first is a wellness strategy, the second goal a healthy communities strategy, and the third "to improve the quality, accessibility, and sustainability of health and community services." Throughout the report, there are many references to health promotion, health protection, illness and injury prevention, child and youth initiatives, and the non-medical determinants of health. Five-year targets are listed in an appendix.

TABLE 2

Health care funding over six years (beginning in 2000-01), as per the 2000 Health Accord.

Area of funding	Amount
Canada Health and Social Transfer increases	$18.9 billion
Medical Equipment Fund	$1.0 billion
Health information technology	$0.5 billion
Health Transition Fund for Primary Care	$0.8 billion
Early childhood development	$2.2 billion
Total	***$23.4 billion***

From a national perspective, the *Commission on the Future of Health Care in Canada*[14], under the direction of the Hon. Mr. Roy Romanow was asked to "recommend policies" that would strike "an appropriate balance between investments in prevention and health maintenance and those directed to care and treatment." The Romanow report devotes one chapter to primary care and prevention. His definition of primary care ("services ... provided not only to individuals but also to communities as a whole, including public health programs that deal with epidemics, improve water or air quality, or health promotion programs designed to reduce risks related to tobacco, alcohol and substance abuse") conflates general practice with traditional public health activities.

Three of Mr. Romanow's recommendations deal specifically with public health issues. He recommends a national immunization strategy, a physical activity strategy, and strengthening health promotion and prevention programs, focusing initially on obesity and tobacco use. Funding for these initiatives would come from a Primary Health Care Transfer. The proposed Health Council of Canada is to monitor these activities, establish common indicators, and set benchmarks. Mr. Romanow also recommends that the federal government take a more active role in international health, focusing on public health initiatives and the training of health care providers in developing countries.

One senior public health leader later commented:

> *"Sadly, the long-awaited Romanow Report did not entirely grapple with—or indeed even mention—the serious plight of public health services in Canada. Instead, it offered some suggestions for investments in disease prevention and health promotion, such as the creation of a central fund for harmonized immunization programs and a Centre for Health Innovation focusing on 'Health Promotion'. Much of the report did not sufficiently differentiate the complementary roles of primary care and public health in achieving disease prevention and health promotion goals. As a result, it gives the impression that all such activities—even health protection from hazardous exposure, and the sort of community-based cultural change that we need to tackle the obesity epidemic—can be spearheaded from physicians' offices and ambulatory care centres."*[15]

The Standing Senate Committee on Social Affairs, Science and Technology chaired by Senator Michael Kirby released *The Health of Canadians –The Federal Role* in October 2002 after a two-year study of the Canadian health care system.[16] A chapter is devoted to the argument that healthy public policy must include health and wellness promotion, illness and injury prevention, public health and health protection, and population health strategies, and that the federal government can and should play a leadership role in these areas. Kirby et al focus on two areas of public health. The first is a National Chronic Disease Prevention Strategy that incorporates public education efforts, mass media programs, and policy interventions targeting lifestyle behaviours such as a poor diet, lack of exercise, smoking, excessive alcohol intake, and stress. Kirby et al suggest that the federal government should commit $125 million annually towards chronic disease prevention. The second area of focus is the deficiency in public health infrastructure. The Senate Committee specifically cited inconsistent funding, fragmentation and poor coordination between jurisdictions, and an overall lack of accountability and leadership. Regarding health promotion efforts, Kirby et al mention poor coordination between government and non-governmental organizations and low funding relative to spending on health care. The Committee accordingly recommended additional funding of $200 million annually to sustain, better coordinate, and integrate the public health infrastructure as well as relevant health promotion efforts.

The Senate Committee's recommendations have yet to be operationalized, notwithstanding another major re-investment in health services by the federal government. Specifically, on February 5, 2003, the First Ministers and the federal government reached another agreement on incremental funding for health care. This agreement provided for $34.8 billion in additional funds for health over a five-year period (2003-4 to 2007-8). Of these, $30.9 billion represent new spending over and above the previous Health Accord. The funding has been directed as shown in Table 3 below.

TABLE 3

Health care funding over five years (beginning in 2003-04), as per the 2003 Health Accord

Area of funding	Amount
Canada Health and Social Transfer increases	$12 billion
Health Reform Fund	$16 billion
Diagnostic/medical equipment	$1.5 billion
Health information technology	$600 million
Research hospitals	$500 million
Direct Health Accord initiatives	$1.585 billion
Other health reform initiatives	$1.364 billion
First Nations and Inuit Health	$1.25 billion
Total	***$34.8 billion***

The text of the 2003 Health Accord mentions "prevention" once. In a paragraph entitled "Healthy Canadians", the Accord acknowledges that there is a "collective responsibility" to deal with issues like exercise and obesity and to promote better public and environmental health.[17] The 2003 Accord directs health ministers to continue working on initiatives to reduce health status disparities, and to pursue a National Immunization Strategy. Funding for these activities appears to come from the "direct Health Accord initiatives" and "other health reform initiatives" line items. Other programs within these line items include patient safety, health human resources, and technology assessment.

The Accord proposes that health ministers develop a set of performance indicators by September 2003, and suggests indicators for the ministers to consider. These indicators are divided into four groups: timely access, quality, sustainability, and health status and wellness. Although two of the suggested wellness indicators deal with obesity and physical activity, public health activities are generally overlooked. For example, none of the suggested indicators discuss vaccination rates, surveillance of communicable diseases, disease screening, breastfeeding rates, or childhood nutrition. The 2003 federal Budget provides $45 million over five years for the National Immunization Strategy and a further $45 million for "Wellness-Sport Participation".

The record of the last several decades is depressingly clear. Even the presence of a major new infectious disease such as HIV was insufficient to galvanize new investments in and reorganization of public health infrastructure in Canada. Notwithstanding the drumbeat of disease prevention and health promotion, governments have steadily committed virtually all new health spending to areas other than public health. We turn accordingly to a brief examination of the funding of public health in Canada.

3D. Funding Public Health in Canada

Tellingly, reliable information on expenditures on public health in Canada is not even readily available. The data published by the Canadian Institute for Health Information [CIHI] are not suitably disaggregated and therefore unhelpful. The public health category includes administrative spending for many other parts of the health care system. For example, the amount shown for Ontario includes the province's contribution to the Canadian Blood Services and the operating costs of the provincial breast cancer screening program. Some other provinces provide no breakdown at all. CIHI intends to publish public health expenditures data separate from general administrative costs of government ministries, but this will not solve the problem of inconsistencies in categories of expenditure included in the public health envelope.

3D.1 National Spending on Public Health

For a view of federal data, Health Canada's "Budget Quick Facts" document does list expenditures by branch and business line. Various branches also provided internal estimates of expenditures on communicable diseases. Expenditures for infectious diseases inside PPHB were calculated from budgets for individual centres.

For provinces and territories, we were able to obtain information on public health budgets from a few provinces and prorated these expenditure data to the entire country. Thus, the national estimates provided here are fairly crude approximations. Data were not available for all subcategories. Data for vaccine costs were taken from a survey of provinces and territories undertaken by Health Canada last year; costs for that year were unusually high as a result of a mass campaign of meningococcal vaccination in Quebec.

Expenditures were estimated for both a narrow definition of public health (roughly corresponding to the activities of official P/T and local public health organizations) and a broader definition (including activities of non-governmental organizations [NGOs] and regulatory functions).

Table 4 provides a summary of estimated public health expenditures in Canada. Total public health expenditures in Canada (2002 - 2003) are estimated at $2.8 billion by the broad definition, and $2 billion by the narrow definition. This corresponds to per capita expenditures of $88 and $65, respectively. CIHI has forecasted 2002 health expenditures of $79.4 billion for the public sector alone and $112.2 billion for the public and private sectors combined. Public health by the broader and narrower definitions therefore amounts to 2.5% and 1.8% respectively of total health expenditures (public and private) or 3.5% and 2.6% respectively of publicly-funded expenditures. Public health expenditures for infectious diseases specifically, are estimated at $787 million or $25 per capita. This corresponds to 1.0% of public health care expenditures.

3D.2 Expenditure Trends in Ontario

We attempted to examine public health system funding trends in more detail for the Province of Ontario. Our interest was piqued by the fact that Ontario has a set of mandatory programs for local public health units and measures compliance with them. The programs represent a solid foundation for public health, and thus the relationship between program compliance and funding seemed to offer a potential benchmark for analysis.

TABLE 4

Summary of Estimated Public Health Expenditures - Federal and Provincial/Territorial Departments of Health, 2002.

	Total Expenditures ($ million)	Per Capita Expenditures $	As Proportion of Health Care Expenditures	
			Total	*Publicly-funded*
Broad definition	2,762.4	88	2.5%	3.5%
Narrow definition	2,047.0	65	1.8%	2.6%

TABLE 5

Breakdown of Estimated Public Health Expenditures by Federal and Provincial Departments of Health in Canada, 2002* ($ millions)

	Direct Spending	Grants & Contributions for Community-based Interventions	Total Broad definition[1,4]	Total Narrow definition[2]
Federal [Health Canada] only]				
PPHB	186.8	200.3	387.5	225.0[4]
Other Branches	497.9[3]		497.9	75.0[5]
Vaccines	25.3		25.3	25.3
Subtotal	710.0	200.3	910.7	325.3
P/T				
Ontario	443.7[6]	-	528.3[10]	443.7[6]
B.C.	234.8[7]	-	246.5[9]	234.8[7]
Nova Scotia	28.4[8]	-	29.8[9]	28.4
Manitoba	43.0[8]	-	45[9]	43.0
Prorated to Rest of Canada[11]	622.8		653.3	622.8
Vaccines	349		349	349
Subtotal	1721.7		1851.9	1721.7
Total	***2431.7***	***200.3***	***2762.6***	***2047***

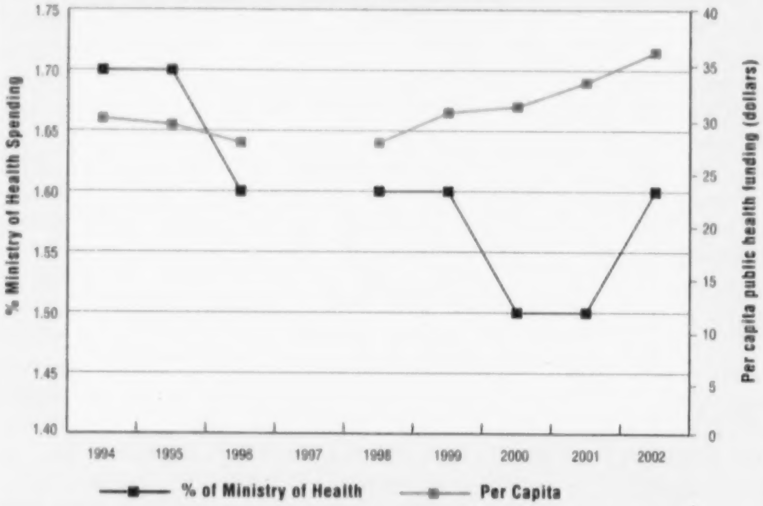
Notes:

1 Local public health plus regulatory functions and grants and contributions for community-based interventions
2 Functions corresponding to work done by local official public health agencies
3 Healthy Environments and Consumer Safety Branch [HECS], Health Products and Food Branch [HPFB], Pest Management Regulatory Agency [PMRA], expenditures for the 'protection & promotion of health' business line, plus the public health portion of First Nations and Inuit Health Branch [FNIHB] expenditures
4 Direct spending + estimated portion of grants and contributions
5 Estimated public health-like expenditures by FNIHB
6 includes municipal portion + provincial public health branch
7 BC CDC plus Ministry and transfers to regions minus public health labs and vaccines
8 Ministry plus transfers to regions (Nova Scotia: +10% for food safety and related health inspection services)
9 Estimate - approximately 5% allowance for health promotion grants and regulatory work
10 Addition of health promotion transfer grants + Healthy Babies, Healthy Children Program
11 Prorated on a per capita cost basis by region: Manitoba for Alberta and Saskatchewan, Nova Scotia for Maritime provinces and territories, British Columbia for Quebec.

* Best available data as of May 2003.

FIGURE 1

Local Public Health Funding in Ontario — Percentage of Ministry of Health Spending and Per Capita Estimate



Local public health funding is based on provincial and municipal contributions to public health departments in Ontario. The provincial component coincides primarily with the "Official Local Health Agencies" line item in Public Accounts. Data are missing for 1997 due to the time-limited downloading policy of the provincial government.

Unfortunately, examining funding trends for the public health system in Ontario was problematic for several reasons. Substantial funding by municipalities is not captured by provincial public accounts or estimates. In the transition to the current 50:50 cost sharing with municipalities, there was a brief period of 100% funding of local programming by municipalities. The province has also introduced a large and expanding Healthy Babies, Healthy Children Program. Further, non-public health budget lines appear to be embedded in the public health vote.

The Ontario Association of Local Health Agencies (alPHa) has tried to track funding for local public health departments. Data were available for selected years from 1994-2002. These figures combine provincial and municipal funding of local public health departments. Figure 1 above suggests that local public health funding lagged the growth in overall provincial health care spending during the period of 1996-2001. Funding as a percentage of total health spending increased in 2002, but remains below levels observed in 1994 and 1995. Per capita spending, unadjusted for inflation, has clearly increased from 1998 through 2002. The total public health budget net of revenue and excluded items plus unorganized areas ($3.3 million) was $304.4 million in 1998 and $435.9 million in 2002. Per capita spending appears similar to Manitoba but lower than British Columbia; however, interprovincial comparisons must be drawn cautiously given limitations of the data.

Funding trend data do not address the broader issue of whether current funding is sufficient to fulfill the mandate of the public health system. As noted, Ontario's Mandatory Health Programs and Services offered a potential benchmark. The Program standards and requirements are reasonably detailed and have a strong service delivery perspective. Starting in 1998, the Public Health Branch developed a series of indicators to facilitate local health departments' reporting on the extent of compliance with the Mandatory Programs. The Public Health Branch annually compiles information from a Mandatory Program Indicator Questionnaire [MPIQ]. Provincial averages for overall compliance as evidenced by MPIQ results are reported to have increased from 70.9% to 82.6% from the period of 1998 to 2001. The extent to which the additional funding is responsible for rising compliance is unclear.

3D.3 A Modest Investment by Any Measure

CIHI data report that public health and administration together account for 6% of health care spending. The investment in public health is clearly the smaller part of that percentage. Convergent validation of the estimates developed above is derived from Alberta data. As noted earlier, Alberta's regional health authorities [RHAs] are responsible for the delivery of both acute and chronic care, as well as public health programs. In 1999-2000, RHA spending on "promotion, prevention, and protection" accounted for 2.9% of their budgets. This number is consistent with our estimates that public health spending amounts to approximately 2% of total health spending. These estimates are also in a range familiar to public health practitioners, i.e., between 1.5% and 3% of health spending. Only by using the broader definition of public health and the smaller denominator of public spending alone does the figure move slightly outside that range to 3.5%. The good news is that, because public health remains a very small part of total health spending, relatively modest investments could have a transformative impact. The bad news is that there are clearly inconsistencies in public health programming and spending within and between provinces and territories, with the result that uniform conditional transfers by the federal government to reinforce capacity will be difficult to operationalize.

Overall spending targets are difficult to set as there are limited data on spending trends and outputs, let alone health status outcomes. The Ontario data are consistent with the common opinion that absolute levels of public health funding have generally increased, but lagged behind spending on health care in general. This latter point has been supported in a submission to the Committee by the Canadian Medical Association. Comparisons of expenditures across jurisdictions are also difficult, as no two provinces seem to include exactly the same activities within the public health funding envelope. For example, in several western provinces, most or all of immunization, including vaccine and delivery costs, is provided through public health, whereas in Ontario and Quebec most immunizations are given in physicians' offices and delivery is funded through the medical insurance plan.

If one takes British Columbia as a benchmark, and calculates the incremental funding required to bring all provinces up to the per capita spending apparent for British Columbia, governments would need to spend an additional $408 million per annum. But this figure is imprecise. Some services included in the British Columbia public health envelope may be funded through different envelopes in other provinces, and we have no way of being certain that British Columbia's spending in any way represents a 'gold standard' for public health. The incremental spending proposed does not consider the potential differences in delivery costs due to geographically-dispersed populations, variable proportions of higher needs populations, or fixed system costs that are partly independent of population size. We turn therefore to international comparisons for additional enlightenment.

3E. International Comparisons

For comparative purposes, the Committee asked Health Canada to obtain information on the organization, governance and funding of public health in selected foreign countries, with an emphasis on national agencies. We have reviewed material on the USA, the United Kingdom, Australia, New Zealand, Sweden, Finland, and Norway. We found the organization and governance of public health to be particularly informative for the USA, United Kingdom, and Australia, and review these below.

3E.1 United States of America

The USA combines a large population (297 million), the highest average per capita income on the globe, dramatic income-related and ethno-racial health status disparities, geographic challenges that are only slightly less daunting than those in Canada, and a federal system of government that includes 57 separate governments at the state/territorial/district level.

The Institute of Medicine has recently published a comprehensive and critical review of public health infrastructure in the United States.[18] As the Institute's report highlights, the health care context is different from other developed countries: the Department of Health and Human Services, through its Medicare and Medicaid programs (the latter a joint venture with the states) is the largest insurer in the country. However, absent universal health care insurance, the majority of Americans obtain insurance privately, with about 40 million uninsured, relying on a patchwork of state, local and voluntary programs for service. This tends to confuse the public health picture, as public health programs at the state and municipal level are often an amalgam of population health and clinical prevention programs and curative care for the indigent and uninsured populations.

The US constitution gives states primary responsibility for health. The federal government has a limited role in the direct delivery of public health services, but does provide leadership, has some regulatory authority, and contributes operational and financial resources. The ultimate authority for public health in the USA rests with the Secretary of Health and Human Services. The Assistant Secretary for Health is the principal advisor to the Secretary on public health and related scientific issues. Presently, the Acting Assistant Secretary is Dr. Richard Carmona, who is also the Surgeon General. There is also an Assistant Secretary for Public Health Emergency Preparedness.

The lead agency for public health activity at the federal level is the **US Department of Health and Human Services** [DHHS] (see Appendix 3.1 for an organizational chart). The DHHS oversees several key agencies including the Centers for Disease Control and Prevention [CDC], referenced in the two previous chapters. Numerous committees in both the House of Representatives and Senate have jurisdiction over HHS activity. The roles of DHHS include:

Policy making: For example, the DHHS, through its Healthy People initiative, sets goals and objectives for health promotion and disease prevention.

Financing public health activities: Whereas much of the CDC budget flows through to the states and territories, the Institute of Medicine [IOM] notes that other spending by DHHS in the public health sphere goes not to public health activities as we understand them, but to personal health care services through Medicaid.

Public health protection: The federal government is heavily involved in this area through the Food and Drug Administration [FDA], and the Centers for Medicare and Medicaid Services which regulates health care providers and laboratories.

Collecting and disseminating information: Numerous federal agencies collect key health data.

Capacity building for population health: The federal government is expected to ensure that state and local governments have the resources (human, financial, organizational, etc.) to carry out their responsibilities. In practice, state public health agencies are chronically under-funded. When states do receive additional funds from the federal government, they sometimes use these resources to reduce the proportion of state expenses directed towards public health activities, i.e., the funds substitute for, rather than increase, existing state-level public health spending.

Direct management of services: These allocations include Medicaid, Medicare, funding of the Indian Health Service, and some community health centres.

Faced with a constitutional division of powers similar to that in Canada, the DHHS must work with State, Local and Tribal governments to fulfill its mission of protecting the health of all Americans. The **US Public Health Service** [PHS] combines eight HHS agencies with the Office of Public Health and Science [OPHS] that houses the Office of the Surgeon General. The Surgeon General directs the PHS Commissioned Corps—a quasi-military unit of 6,000 uniformed public health professionals.

The federal government has constitutional responsibility for preventing entry of disease into the USA and, under the Interstate Commerce clause of the Constitution, for preventing the interstate spread of disease. The USA has specific legislation (the Public Health Threats and Emergencies Act, 2000, also known as the Frist/Kennedy Act) aimed at countering bioterrorism through the improvement of public health infra- and infostructure at state and local levels. Other relevant legislation governs immunization and vaccine purchase, and includes several long-standing "categorical" programs to fund specific nationwide programs, usually with an emphasis on the poor or on children and youth, often in partnership with states.

Apart from the CDC, other agencies under the umbrella of the DHHS in the USA are listed below. The list shows their 2002 HHS budget authority in parentheses; these agencies may receive additional funding from non-HHS sources:

- Food and Drug Administration (US$1.3 billion)
- Health Resources & Services Administration (US$6.2 billion)
- Indian Health Service (US$2.9 billion)
- National Institutes of Health (US$23.6 billion)
- Substance Abuse & Mental Health Services (US$3.1 billion)
- Agency for Healthcare Research & Quality (US$0.3 billion)
- Centers for Medicare & Medicaid Services (US$388 billion)
- Administration for Children & Families (US$47.3 billion)
- Administration on Aging (US$1.3 billion)

The **Centers for Disease Control and Prevention** [CDC] was founded in 1946 to combat malaria, typhus and other communicable diseases. As noted in Chapter 1, CDC initially stood for "Communicable Disease Center." The CDC was renamed the Center for Disease Control in 1970, and added "Prevention" to its name (but not the acronym) in 1992. It is an operating division of the Department of Health and Human Services, and the largest federal agency outside Washington, D.C. The CDC has always been based in Atlanta, but over 2,000 of the approximately 8,600 full-time equivalent employees work elsewhere; this includes postings in 47 state health departments, with 120 CDC employees overseas. Some CDC staff are also members of the Commissioned Corps of the PHS. The CDC's current mission is "to promote health and quality of life by preventing and controlling disease, injury, and disability." The federal government created the Agency for Toxic Substances and Disease Registry [ATSDR] in 1980. The director of the CDC also serves as the administrator of the ATSDR; the CDC and the ATSDR submit a joint budget request.

The CDC has 12 centres, institutes and offices. The Director is always a public health physician and the senior staff are predominantly health professionals and scientists. The CDC maintains a very high public profile, and has a strong 'corporate brand'. Its director reports to the Secretary for Health and Human Services through the Deputy Secretary.

The CDC exerts considerable influence at state and local levels. In part this is due to the CDC's Epidemic Intelligence Service [EIS]. The EIS was a forerunner of similar programs in Canada and elsewhere. The EIS is at once a training program in field epidemiology, surveillance and disease control, and a significant part of the CDC's ability to respond rapidly to outbreaks anywhere in the USA or abroad. It helps to ensure that the CDC can dispatch teams to assist or lead local investigations into disease outbreaks.

Many of the state and local staff were trained in the CDC EIS. Most states also have CDC staff stationed in key state agencies.

The CDC is the clear international leader in the areas of surveillance systems, databases, outbreak investigation, and communicable disease epidemiology. The speed with which the CDC and the PHS Corps can respond to an emergency infectious outbreak is unmatched globally.

The programs of the CDC are directed towards two major functions. It provides infrastructure support to the states and local health agencies. It also serves as the national command centre for health emergencies, including new or re-emerging infectious diseases and bioterrorism. The CDC engages in research, offers technical advice to multiple nations, and helps with program development in the USA and around the world.

The infrastructure programs are set out below:

The National Public Health Standards Program develops capacity and performance standards, provides for evaluation against these standards and provides grants and technical assistance to state and local health authorities to address deficiencies. Although states are free to reject the CDC's performance standards, the CDC's funding of state-level programs gives it substantial influence.

The Health Alert Network links all state and local health departments to secure communication systems through the development of architecture, technical assistance and grant-supported projects.

The Public Health Workforce Development Initiative includes a comprehensive strategy for life-long learning for public health practitioners, and has two arms: the Public Health Training Network and the National Laboratory Training Network.

The National Public Health Laboratory System, beginning with standardization and enhanced testing, aims to develop policies and public-private partnerships that would enable improved and more timely reporting of laboratory results.

The Public Health Information Network is the architecture for a comprehensive system for the capture and exchange of surveillance information. It provides desktop access to important information for public health practitioners.

The Public Health Emergency Fund is available for federal action on public health emergencies.

The situation with surveillance in the USA is not dissimilar to Canada with respect to legal authority. Mandatory reporting of infectious diseases occurs at the state or even local level in the USA. Although the CDC and the Council of State and Territorial Epidemiologists jointly maintain a list of nationally notifiable infectious diseases, reporting to the CDC is voluntary. On the other hand, the CDC performs a crucial role in disease surveillance, offering leadership and coordination, education, laboratory testing, and information technology, as well as direct funding. In the last category, for example, the National Center for Infectious Diseases distributed US$31.2 million to states in 1998 through various grants for surveillance. Other CDC departments also provide funding to states for surveillance. In 2002, bioterrorism funding enabled the CDC to disburse almost US$1 billion to states, of which approximately US$183 million was for surveillance and epidemiology. In short, given constitutional limits and recent legislation that prevents the imposition of unfunded mandates on states by federal regulators, the CDC essentially purchases a national surveillance system through earmarked state-level funding and partnerships.

In the USA, the Healthy People 2010 Objectives (published every ten years) contain quantifiable objectives, and progress towards them is measured. This stands in contrast to Canada, where an overarching public health strategy for the nation has never been articulated.

Essential public health services have been defined. The CDC offers programs and funding to review state/local performance; a framework for organizing, assessing and developing public health staff care competencies; and a potential framework for new/revised public health legislation. Again, the contrast to Canada is striking. Direct transfers to P/T governments earmarked for public health do not occur in this nation, leading to inter-jurisdictional inconsistencies along with limited national coordination. The federal presence in public health is also much reduced.

The enacted CDC budget for the 2002 fiscal year (FY 2002) is outlined in the CDC's budget request for FY 2004. Allocations for 2003 had not been formally enacted at the time of the 2004 budget request; nevertheless, as 2004 requests are generally similar both in total and by category to actual 2002 and expected 2003 enactments, this report presents data for 2002 only.

The CDC's total 2002 budget of approximately US$6.5 billion excludes approximately US$1.2 billion transferred from the CDC's terrorism budget to the Department of Homeland Security for accumulation of a "strategic national stockpile" and the smallpox vaccination program. The CDC receives funding via several mechanisms (e.g., the Labor-Health and Human Services-Education regular appropriations bill, the Veteran Affairs-Housing and Urban Development regular appropriations bill, the Public Health and Social Services Emergency Fund, etc.). Budget details are presented by program in Table 6.

Although responsibility for public health rests with the states constitutionally, the degree of commitment to public health by states and territories varies greatly. A few states invest heavily, and others hardly at all. State health departments are usually headed by a professionally-qualified director or commissioner. However, this official may have responsibility not only for public health, but also for Medicaid, professional licensing and other health care matters, and perhaps child welfare and some social services as well. In the interests of brevity, we shall not review state-specific arrangements in detail here. Suffice it to say that the provision of local and regional public health services appears more variable in the US than in Canada. While some larger cities have very effective public health units, there are also several thousand local (usually county-based) agencies, many too small to be effective or attract qualified staff. Resources are constrained by local ratepayer interest, as a substantial portion of the funding for local agencies comes from municipal or country-level taxes and revenues.

TABLE 6

Budget for the Centers for Disease Control and Prevention, USA, 2002 (US$).

Program	**Expenditure (US$, 000)**	**Percent**
Birth Defects and Disabilities	***$89,946***	***1.4%***
Chronic Disease Prevention and Health Promotion	***$746,731***	***11.4%***
Heart Disease and Stroke	$37,378	
Diabetes	$61,683	
Cancer	$268,627	
Arthritis and Other Chronic Diseases	$20,812	
Tobacco	$100,973	
Nutrition, Physical Activity, and Obesity	$27,505	
Health Promotion	$15,235	
School Health	$58,443	
Safe Motherhood/Infant Health	$50,697	
Oral Health	$10,814	
Prevention Centers	$26,176	
Youth Media Campaign	$68,388	
Environmental Health	***$153,397***	***2.3%***
Epidemic Services and Response	***$80,156***	***1.2%***
Health Statistics	***$126,750***	***1.9%***
HIV/AIDS, STD and TB Prevention	***$1,156,826***	***17.6%***
HIV/AIDS – Domestic	$689,169	
HIV/AIDS – International	$168,720	
STDs	$166,534	
TB	$132,403	
Immunizations *(state programs, public health clinics)*	***$627,239***	***9.6%***
Infectious Disease Control	***$348,181***	***5.3%***
Injury Prevention and Control	***$149,502***	***2.3%***
Occupational Safety and Health	***$275,808***	***4.2%***
Preventive Health and Health Services Block Grant	***$134,958***	***2.1%***
Public Health Improvement	***$148,306***	***2.3%***
Emergency Response and Recovery	***$12,000***	***0.2%***
Office of the Director	***$49,077***	***0.7%***
Buildings and Facilities	***$296,000***	***4.5%***
ATSDR	***$78,203***	***1.2%***
Terrorism (Nonbuildings and Facilities)	***$1,101,439***	***16.8%***
Upgrading State and Local Capacity	$940,174	
Upgrading CDC Capacity	$143,225	
Anthrax	$18,040	
Vaccines for Children *(Medicaid, uninsured, native, etc.)*	***$989,535***	***15.1%***
User Fees	***$2,226***	***0.0%***
Total	**$6,566,280**	**100.0%**

The first line for outbreak management remains at the local and then state level in the USA. The CDC must be invited to offer support, but thereafter it plays particularly strong roles in outbreak investigation and strategic advice. The CDC's influence and surveillance systems also ensure that, with few exceptions, it enters the fray early in any serious outbreak. Just as in Canada, jurisdictional tensions occur. However, the conspicuous position of the CDC in US outbreaks arises from its own firepower, its funding of activities by other governmental jurisdictions, the role that it plays in training and capacity-building, direct secondments of federal personnel into state/territorial agencies, and, not least, limits in capacity at the local or regional level.

3E.2 United Kingdom

Although the United Kingdom does not have a federal constitution, three separate health systems are in operation for England and Wales, Scotland, and Northern Ireland. Each is a variation on the basic model of the National Health Service [NHS].

Britain was a pioneer in many aspects of public health during the nineteenth century. Its strong municipally-based public health programs were largely absorbed into the NHS when the latter was created in 1948. Since then, public health has been closely integrated with other NHS functions. Furthermore, public health physicians in the United Kingdom have wide-ranging roles. They are not only engaged in public health as we understand it, but also in planning, commissioning and managing the quality of the NHS clinical services.

The basic organizational unit of the NHS is the *Primary Care Trust*. Many public health services are provided at this level. Since April 2002, the trusts are accountable to 28 *Strategic Health Authorities*, each with a regional director of public health. The public health directors in the Strategic Health Authorities are charged with the development of a cross-governmental and cross-sectoral approach to the determinants of health. Public health policy informs and is informed by regional work on economic regeneration, education, employment and transport. The directors give high priority to partnerships with primary care physicians. They are accountable for health protection (including control of communicable diseases and environmental hazards) across the region, and play a role in emergency and disaster planning and management. The public health directors are also often a point of contact for concerns about clinical standards. In essence, serious lapses in clinical quality are regarded as tantamount to iatrogenic disease outbreaks, and may be investigated accordingly in tandem with clinical governance. Each region has its own characteristics and public health priorities.

Intriguingly, the Cabinet includes not only a Minister of Health but a *Parliamentary Under Secretary of State for Public Health*, essentially a junior minister, with specific responsibilities for a strategy to improve the health of the public and for policies on issues such as tobacco control and food safety. The government published a green paper and subsequent white paper (*Saving Lives: Our Healthier Nation*) setting out the government's strategy for public health policy. In contrast to the Canadian situation, the white paper identified five priority areas for reducing mortality and morbidity and 25 quantified targets for achieving reductions in mortality and morbidity over given timescales. Work in progress is addressing targets for addressing health inequalities and tackling some of the social and environmental determinants of health. Public health activities are subject to national health frameworks: each Strategic Health Authority measures the performance of the primary care trusts within its boundaries, and the performance of Strategic Health Authorities in turn is assessed centrally. In sum, Britain is making an effort to create an accountable hierarchy of performance measurement in public health, a structure parallel to its innovative system of performance measurement for clinical or personal health services.

The UK government recently formed a *Health Protection Agency*. It drew together the Public Health Laboratory Service (including the Communicable Disease Surveillance Centre), the Centre for Applied Microbiology and Research, NHS staff responsible for communicable disease control and emergency planning, and units responsible for chemical exposures and poison control. The staff in this agency number 2,700 in 9 regional offices. This second line of defence against outbreaks is an important innovation to which we shall return.

The government operates other agencies designed to drive a research agenda in public health and translate evidence into action. The *Health Development Agency* has an annual budget of about C$23 million. Focused on knowledge translation, the agency finances systematic reviews, gathers evidence and makes it available to public health authorities, advises on good public health practice, and supports the information needs of front-line public health workers. It has a particular interest in health promotion and works closely with both local public health agencies and community groups. The Department of Health also funds the Policy Research Programme to help ensure that public health policy, plans, and practices are based on reliable evidence about population needs and effective interventions. All of the research is directly commissioned (costing around C$67 million per annum). More generally, the Department of Health will spend approximately C$1.21 billion in 2002/03 through the Policy Research Programme and NHS R&D Programme. While the NHS R&D Programme has a strong applied clinical and health services focus, a meaningful proportion of the research spills over to inform public health issues. The British Medical Research Council is funded separately for investigator-initiated research across the full range of health research.

3E.3 Australia

Australia is similar to Canada with its vast land mass, modest population (now about 19 million), and federal system of government. Australia's federation is comprised of six states and two territories. The Commonwealth (federal) government has a broad policy leadership and financing role in health matters, while the states and territories are largely responsible for the delivery of public hospital and community services. Australia has moved back and forth with various configurations of private-public mix in financing and delivering personal health services. Currently, it operates a national compulsory tax-based system of public health insurance (known as Medicare), graduated on the basis of income and general taxation, that provides access to medical and hospital services for all Australians. The Commonwealth has recently introduced a number of key policy initiatives to increase participation in parallel private health insurance. The Commonwealth also provides management and control of communicable diseases, and regulates food, therapeutic goods, and chemicals.

The Commonwealth Department of Health and Aged Care coordinates surveillance, prevention, management and control of communicable diseases, and regulation of food and therapeutic products. However, funding of public health differs from funding of hospital and medical services. While the Commonwealth (under the Australia Health Care Agreements) pays 75% of total funding for public hospital services, it pays for half of the public health services funding (30% via direct expenditure and 22% via payments to States and Territories). The states and territories contribute the remainder. Based on 1999/2000 data, A$931 million was spent on core public health activities (less than 2% of health expenditure in Australia).

Joint public health activities conducted by the Commonwealth and State/Territories Health Authorities are coordinated through the *National Public Health Partnership*, a sub-committee of the Australian Health Minister's Conference. States and territories vary in the organization of their public health services, with differing numbers of local and regional public health units, variable integration with community health centres, and considerable variation in the role of NGOs or stand-alone foundations.

In February 2003, all Health Ministers signed a memorandum of understanding to continue the National Public Health Partnership [NPHP] for the period 2003-2007. The memorandum sets out the objectives of the NPHP, clarifies the roles and responsibilities of the respective parties to the multilateral agreement and describes the arrangements for implementation. The NPHP Group is comprised of a senior representative from Commonwealth, State and Territory Health Departments (voting members), senior representatives of the Australian Institute of Health and Welfare and the National Health and Medical Research Council (non-voting members) and two observers (the New Zealand Ministry of Health and the NPHP Advisory Group). The NPHP has already established subgroups in areas such as communicable diseases and AIDS.

The Program priorities for the NPHP are clearly identified. They include: 1) improving public health practice; 2) developing public health information systems; 3) reviewing and harmonizing public health legislation; 4) implementing public health workforce initiatives; 5) strengthening national public health research and development capacity; 6) improving the coordination of national public health strategies; 7) developing standards for the delivery of core public health strategies; and 8) improving Aboriginal and Torres Strait Islander health. Lessons for Canada from these collaborative arrangements with explicit priorities are self-evident.

The Commonwealth contributes towards the capacity of states and territories through *Public Health Outcome Funding Agreements [PHOFAs]*. Base funding is provided for major national health priorities. PHOFAs include specific outcome reporting requirements. This year, the Commonwealth Department of Health & Welfare provided funds for SARS screening at airports, vaccines, and improved prevention in primary care.

The NPHP has made substantial efforts to integrate the preventive work of general practitioners with other primary care services and community services. These steps should help to integrate the personal service continuum with broader public health programming. In particular, the NPHP is working with the General Practice Advisory Committee to improve the adoption of preventive and early intervention approaches by general practitioners, thereby rationalizing the complementary role of clinical and population strategies for prevention. Research on population health issues and epidemiologic study is supported at the Commonwealth level through two mechanisms. The National Health and Medical Research Council [NHMRC] provides independent, expert advice to government in health issues and research grants. As well, the *Public Health Education and Research Program* funds Australian tertiary institutions to strengthen post-graduate education and training, including preparation of public health practitioners and research training in population health.

3F. Some Reflections and Conclusions

SARS is simply the latest in a series of recent bellwethers for the fragile state of Canada's federal/provincial/municipal public health systems. The pattern is now familiar. Public health is taken for granted until disease outbreaks occur, whereupon a brief flurry of lip service leads to minimal investments and little real change in public health infrastructure or priorities. This cycle must end.

Canadians have seen high-profile disease clusters arising from the contamination of water supplies in Walkerton, Ontario and North Battleford, Saskatchewan. Both had tragic effects. Last year, the nation faced an outbreak of West Nile virus. West Nile virus is another zoonosis, arising from a reservoir of infected birds and transmitted to humans by mosquito bites. The virus appeared in North America in New York City in 1999, and was detected in Canada by the summer/fall of 2001. Canada recorded about 300 confirmed cases in 2002, some with severe or fatal effects. Variant Creutzfeld Jacob Disease (the human form of Bovine Spongiform Encephalopathy or BSE) has also sparked public anxieties and exacted an economic toll.

The SARS outbreak was moderate in size, in part because effective actions were taken to contain its spread and also because the causative agent is actually less contagious than some other respiratory and enteric viruses. Its social and economic impact, however, was enormous, and its collateral clinical consequences are still being measured.

SARS has highlighted how communicable diseases, particular those caused by hitherto unknown agents, can tap primal anxieties, prompt enormous interest on the part of the media, and provoke some unsavoury public responses (e.g., incidents of harassment and scapegoating of the Asian community in Toronto). The SARS outbreak thereby underscores the need for public health to play a leadership role in analyzing risks and communicating effectively about them. Yet, as the chronology in the last chapter demonstrated, neither the analytical capacity nor the communications strategies were anywhere near optimal.

Many involved have acknowledged the potential consequences of two public health crises happening simultaneously. What if SARS had struck just as public health staff were fully engaged in coping with a bioterrorism attack or an accelerated caseload of infections with West Nile virus? In the absence of a robust public health system with built-in surge capacity, every crisis forces trade-offs—attention to one infectious disease at the expense of others, or infectious disease prevention at the expense of food safety, chronic disease prevention, and other public health responsibilities. In the latter respect, if Canada expends most available public health resources on relatively rare events such as SARS or West Nile virus, we run the risk of winning a few high-profile battles while losing the war for health. A host of partially preventable non-communicable diseases continue to exact a tremendous toll on the health of Canadians, while avoidable injuries cost the nation billions of dollars in direct health spending and indirect costs. Public health has much to contribute apart from containment of communicable diseases.

The chronology in Chapter 2 highlighted the impact of SARS in Canada's richest and largest city in the nation's richest and largest province. Globe and Mail columnist Margaret Wente has tartly commented: "Thanks to near-heroic efforts by public health officials, we managed to fight off a SARS fire spreading at lightning speed with an organization about as sophisticated as an improvised bucket brigade."[19] Support to fight the outbreak was required from other jurisdictions, including scores of volunteers from the USA.

The capacity of other provinces varies but Ontario is assuredly not the 'weakest link' in the P/T public health chain. In this respect, an F/P/T report on Public Health Capacity was prepared for the Conference of Deputy Ministers at their request, and presented in June 2001.[20] It was never formally accepted for publication and dissemination. Some of the key findings highlight potential areas of concern for all Canadians including:

- an overall erosion of the public health system, with survey respondents in key positions noting the reduced capacity to address ongoing and emergent challenges to public health such as water quality safety and management of infectious diseases;
- significant disparities in public health capacity now exist across Canada;
- concerns that the relative low priority given to longer-term disease and injury prevention strategies is increasing threats to the health of Canadians and undermining the sustainability of the health care delivery system;
- a lack of written multi-year plans covering the five core areas of public health practice in more than half the jurisdictions;
- insufficient efforts in staff development and growing recruitment/retention difficulties;
- uncertain capacity of jurisdictions to deal with more than one emergency at a time, or to deliver some core programs, particularly to northern and Aboriginal communities; and
- limited access to health information and eroding leadership on key public health issues.

The SARS outbreak has affirmed these observations. It illustrates an urgent need to strengthen not only the federal role, but also the P/T public health infrastructure. The effectiveness of the public health system depends critically upon capacity at local and provincial/territorial levels. In turn, this demands a well-trained, adequate, and fully prepared workforce, and information and surveillance systems that can detect health threats rapidly, analyse and interpret data and communicate the resulting information to health care providers and the general public as needed. The same infrastructure that will help combat the next outbreak of SARS or a similar communicable disease will also provide Canadians with enhanced health protection and preventive capacity to reduce the burden of non-communicable diseases.

The 2000 and 2003 Health Accords provided major transfers of funds to the provinces for health spending. These transfers offer provinces a resource base that, if they choose, can be tapped to enhance public health infrastructure [PHI]. And, given the very small percentage of publicly-funded health spending directed to public health functions, the levels of investment that would have a transformative effect on public health capacity are comparatively small—ranging by province from tens of millions to the low hundreds of millions annually. A new allocation or re-allocation equivalent to the budget of a single mid-sized general hospital could hugely augment PHI for larger provinces. However, the Committee is under no illusions about the continuing competitive spending pressures on provincial and territorial governments. In the chapters that follow, we are recommending that a substantial majority of the new federal spending on public health be directed to initiatives and programs that will create a seamless, strengthened, and collaborative F/P/T public health system.

In shaping new programs and structures, what general lessons can Canadians learn from public health systems in other countries?

First and foremost, the US, the UK and Australia each have a coherent chain of policy, stretching from legislation, national goals and priorities, national strategies, programs to sustain the public health infrastructure (including human resources), means of reaching agreement between stakeholders, and specific funding programs. There are quantifiable targets with timelines, and accountability mechanisms. In contrast, Canada does not have national health goals or strategies. Even the extant national indicators arising from the Health Accords are focused on the personal health care system.

Second, many countries have agencies for public health led by a recognized expert in the field. Embedding public health functions inside the usual bureaucracy may enhance the crosswalk to other health activities, but tends to blur the professional career path for those with special training in the relevant disciplines, impede the agility of responses to public health emergencies, and augment the politicization of inter-jurisdictional activity. A distinct agency can still be held to account through a variety of mechanisms, and its credibility, for better or worse, is enhanced by its distance from the usual machinery of government. Furthermore, these agencies in other nations help build PHI by continually and generously investing in the training and continuing education of skilled personnel. This must be a high priority for any Canadian public health agency.

Third, the scope of public health agencies varies. Some are focused on infectious diseases alone; others have a general mandate. We see the rationale for single-focus agencies, and commend the work of British Columbia's Centre for Disease Control as a provincial exemplar in the infectious disease field. Federally, Canada already has a Centre for Infectious Disease Prevention and Control under the auspices of PPHB. The Committee believes that any new national agency must encompass a full spectrum of public health activities through a variety of component centres, as exemplified by the USA's CDC, and intriguingly, Quebec's National Institute of Public Health. The scope of the agency nonetheless requires careful assessment as we shall show in the next chapter.

Fourth, the Committee has been struck by the fact that other federations, such as Australia and the USA, also face challenges from the divergent capacity of different provinces or states and territories. The Australian and US response is to confront the challenges of regional pluralism with earmarked funding, mechanisms to foster inter-jurisdictional collaboration and coordination, and agreement on explicit performance standards. Canada needs a more consistent public health system with maximum inter-jurisdictional collaboration on essential functions. Governments in other nations have provided examples of steps that can be taken to meet this need for our citizens.

In seeking to foster a stronger and more integrated national public health system, the Government of Canada can variously use legislation and regulation, provide information and advice, deliver programs itself, or make transfer payments to individuals, organizations, and other levels of government. Each of these has a role to play.

As summarized in Chapter 9, new legislation and regulation could be dovetailed with the recognized need for Ottawa to revise and consolidate all of its public health and health protection legislation. A national public health system would also be facilitated by a stronger national presence, established arm's-length from Health Canada but accountable to the Minister of Health and Parliament, that would provide credible information, advice, and technical support to provinces and territories. The USA's CDC is exemplary in these respects. SARS has shown that an outbreak in one province (or nation) affects all others. Every province and territory would benefit from more effective support for and coordination of public health activities. A strong federal presence is particularly important in supporting smaller provinces faced with epidemics, and is critically important in international liaison.

Direct program delivery by the federal government avoids skirmishing over cash transfers and accountability, but the federal government cannot effectively deliver local public health services nor does it have jurisdiction to do so. As in the USA, the federal government in Canada could instead become more directly involved in surveillance in support of provinces and territories. The Committee is also impressed by the ability of the US CDC to maintain a highly mobile, professionally-trained emergency response structure capable of reacting rapidly to outbreaks of infectious disease or other health emergencies. In an ideal world, a new Canadian agency would support a network of expertise, have sufficient credibility, enjoy collegial relations, and move swiftly across bridges of inter-jurisdictional agreements to help in local outbreak investigations and management. This is one reason why, as will be elaborated in Chapter 5, we envisage a network focused on infectious diseases along with a system of secondments and sharing of personnel designed to create a culture of collaboration.

Transfers are the other policy instrument in the federal tool-kit. As noted above, the federal government currently operates a program of grants and contributions through PPHB. This system moves approximately $200 million per annum primarily to NGOs, and aims at addressing various determinants of health through programs in areas such as prenatal nutrition, Aboriginal early childhood development, healthy living, and prevention of various non-communicable diseases. This set of transfers should be aligned with a new national public health strategy. But what is clearly needed as well is a serious investment directed at the support of provincial, territorial, and municipal public health infrastructure. To this end, both the American and Australian examples are important. Their systems of grants and related agreements with states and territories, incorporating clear targets and reporting mechanisms, exemplify the approach that a new Canadian agency could use to build capacity in accordance with both a national public health strategy and the needs of specific P/T jurisdictions.

The Committee is concerned that new funding for provinces and territories not displace current spending, and end up transferred within provincial health budgets to become another drop in the ever-leaking acute care bucket. New funding should neither preferentially underwrite those provinces that have chosen to invest at levels much below others nor disadvantage provinces such as British Columbia and Quebec that have innovated and invested in public health. Instead, we recommend that a new federal agency allocate these funds in such a way that program expenditures roll up to reflect, with some allowance for year-over-year variation, approximate population size, consistent with the Social Union Framework Agreement.

The national agency should be free to set floors for dovetailed provincial activity or matching conditions before a particular provincial public health branch can receive earmarked program funds. The agency may also choose to underwrite all costs for particular provincial/municipal programs. What the Committee views as crucial, however, is that there be no bulk transfer or passive payments. The monies should be disaggregated into separate program grants, and different provinces should receive funds for different purposes to promote achievement of a stronger and more consistent public health infrastructure. Overall target setting for inter-jurisdictional division of funds thereby becomes a mechanism whereby provinces are both assured of receiving a reasonably fair share of support for their own priorities, and given incentives to set priorities for re-investment in concert with the national agency.

Fifth, the areas of infectious disease surveillance and outbreak management need specific support and attention. Ideally, outbreak management should be harmonized with other provisions for health emergencies and these arrangements in turn dovetailed with broader strategies for emergency preparedness and response. To ensure that these areas receive priority and avoid F/P/T tensions, it seems intuitively appealing to create a new network with earmarked funding inside the agency's envelope for P/T contributions. This would be a uniquely Canadian approach to reconcile some of the inter-jurisdictional uncertainties that arise with public health not just in our federation, but in other federal states as well.

Sixth, Australia, the UK, and the USA all have embedded a strong research and science component in their public health activities. These countries provide a solid foundation in epidemiology, surveillance and health statistics, to inform public health practice. The UK is the international leader in its efforts to ground public health policies and services in solid evidence. Canada needs more applied public health research and evaluation, more systematic reviews and public health practice guidelines, better training in the generation and interpretation of public health evidence, and better means of storing, maintaining and accessing the relevant knowledge for public health practice. These issues have been highlighted in a document produced by the Institute of Population and Public Health within the CIHR. Any new agency must have a combination of in-house capacity alongside funding to contract out R&D functions to partners such as the CIHR. The challenges go beyond public health and demand a review of our scientific capacity with respect to infectious diseases research; further comments on this matter follow in Chapter 10.

Last, in one nation after another, we see efforts made across jurisdictions to exchange and share data and information. Public health practitioners were pioneering users of health information in the eighteenth and nineteenth centuries. More recently, public health, like the personal health care system, has been unable to take full advantage of innovations in information and communication technologies. Three levels of government are involved in public health, and as the SARS outbreak demonstrated, public health must be connected to what is happening in clinics, hospitals, and other parts of the health enterprise. Thus, information must move rapidly to and from the clinical and public health frontlines. Both professionals and the media have been strongly and justifiably critical of the difficulties in sharing information across levels of government that became evident in the recent outbreak of SARS. Special efforts must be made not only to invest in information technology, but also to generate the intergovernmental agreements and information standards that will give Canada a leading-edge public health information system. These must be an integral part of rolling out any new funding, whether for general public health renewal, or earmarked for infectious disease surveillance and outbreak management. Alongside these more informal agreements, and notwithstanding any federal legislative renewal, one can also envisage a process to upgrade and harmonize public health legislation across Canada, facilitating the function of a truly seamless system to protect and promote the health of our citizens, wherever they live.

These are not tall orders. They presuppose in the first instance only a visible and continuing commitment on the part of all those who govern us to the principle that, whatever other differences may inevitably separate us in this sometimes-fractious federation, the health of Canadians is paramount. Beyond that, the investment of new monies needed to transform public health is modest compared to numerous other spheres of public spending, not least the personal health services sector. The single question that the Committee would put to all health ministers, finance ministers, and first ministers is accordingly simple: If not now, when?

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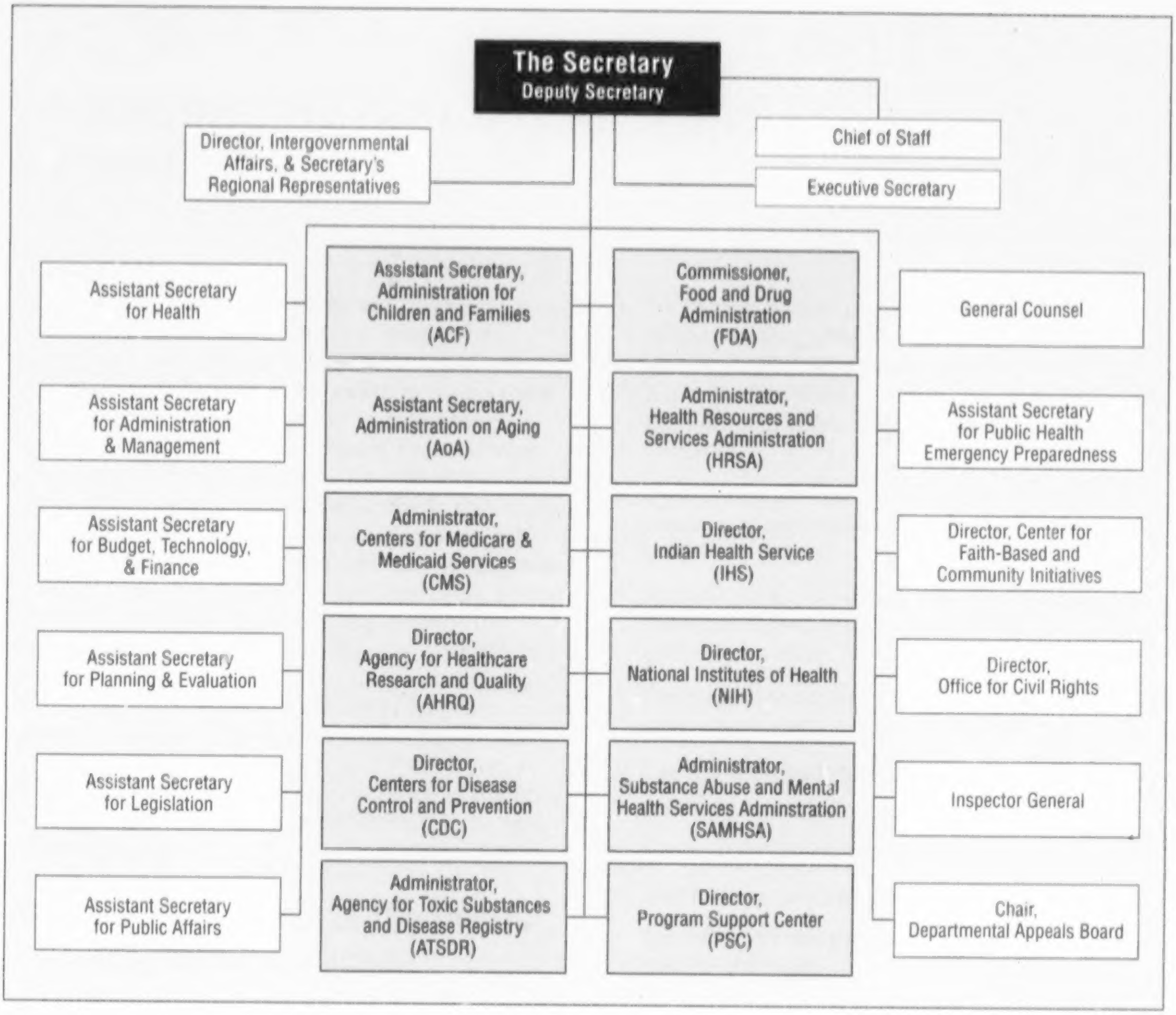
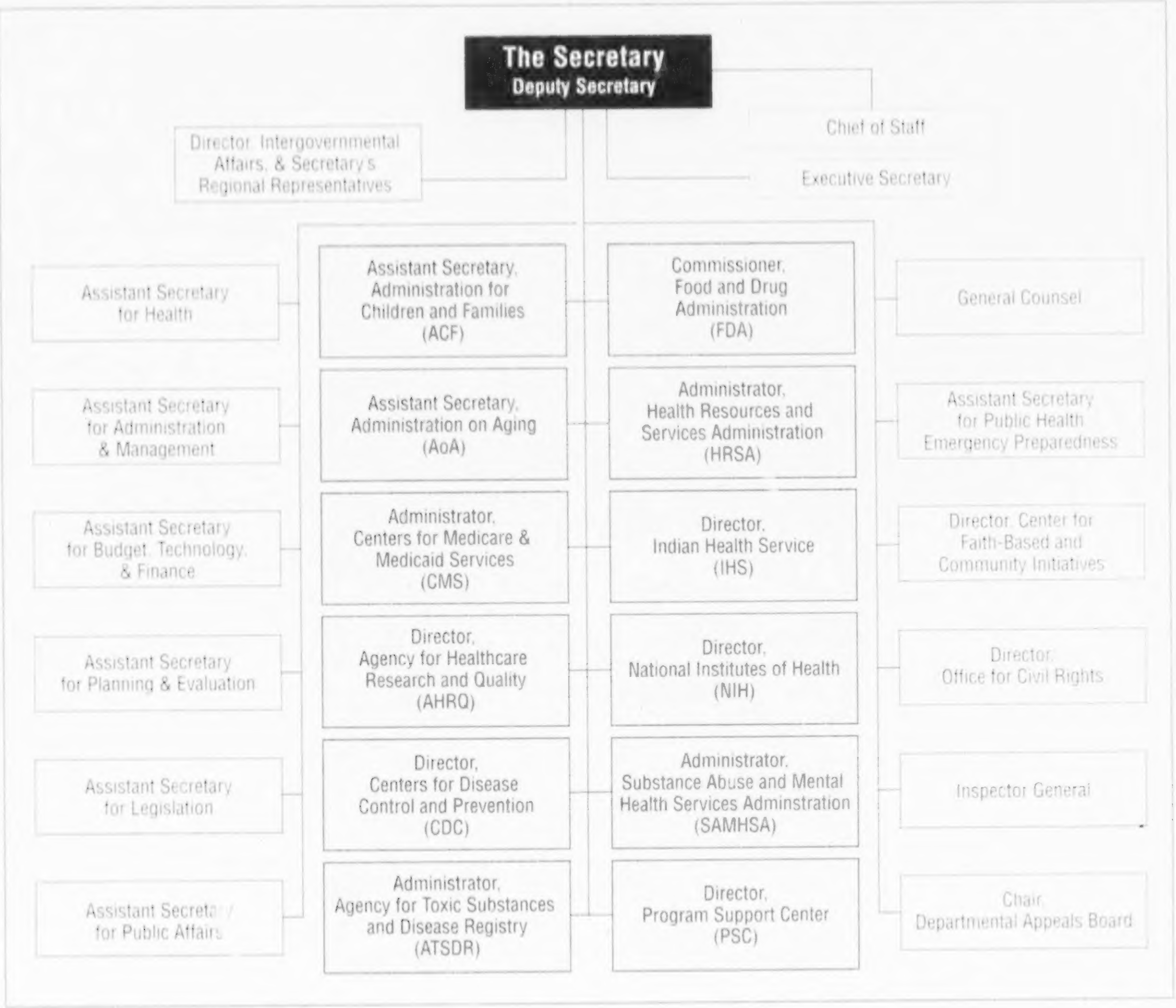
Appendix 3.1

US Department of Health and Human Services Organizational Chart


The Secretary
Deputy Secretary
Director, Intergovernmental Affairs, & Secretary's Regional Representatives
Chief of Staff
Executive Secretary
Assistant Secretary for Health
Assistant Secretary for Administration & Management
Assistant Secretary for Budget, Technology, & Finance
Assistant Secretary for Planning & Evaluation
Assistant Secretary for Legislation
Assistant Secretary for Public Affairs
Assistant Secretary, Administration for Children and Families (ACF)
Assistant Secretary, Administration on Aging (AoA)
Administrator, Centers for Medicare & Medicaid Services (CMS)
Director, Agency for Healthcare Research and Quality (AHRQ)
Director, Centers for Disease Control and Prevention (CDC)
Administrator, Agency for Toxic Substances and Disease Registry (ATSDR)
Commissioner, Food and Drug Administration (FDA)
Administrator, Health Resources and Services Administration (HRSA)
Director, Indian Health Service (IHS)
Director, National Institutes of Health (NIH)
Administrator, Substance Abuse and Mental Health Services Adminstration (SAMHSA)
Director, Program Support Center (PSC)
General Counsel
Assistant Secretary for Public Health Emergency Preparedness
Director, Center for Faith-Based and Community Initiatives
Director, Office for Civil Rights
Inspector General
Chair, Departmental Appeals Board

Appendix 3.1

US Department of Health and Human Services Organizational Chart


The Secretary
Deputy Secretary
Chief of Staff
Executive Secretary
Director, Intergovernmental Affairs, & Secretary's Regional Representatives
Assistant Secretary for Health
Assistant Secretary for Administration & Management
Assistant Secretary for Budget, Technology, & Finance
Assistant Secretary for Planning & Evaluation
Assistant Secretary for Legislation
Assistant Secretary for Public Affairs
Assistant Secretary, Administration for Children and Families (ACF)
Assistant Secretary, Administration on Aging (AoA)
Administrator, Centers for Medicare & Medicaid Services (CMS)
Director, Agency for Healthcare Research and Quality (AHRQ)
Director, Centers for Disease Control and Prevention (CDC)
Administrator, Agency for Toxic Substances and Disease Registry (ATSDR)
Commissioner, Food and Drug Administration (FDA)
Administrator, Health Resources and Services Administration (HRSA)
Director, Indian Health Service (IHS)
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Director, Center for Faith-Based and Community Initiatives
Director, Office for Civil Rights
Inspector General
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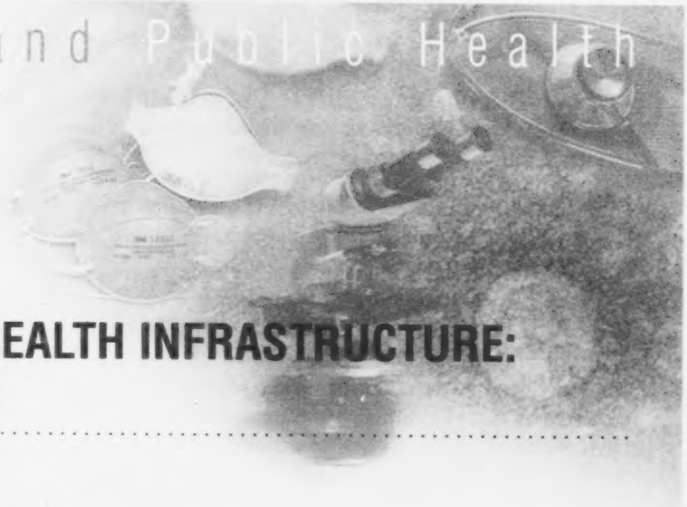

Chapter 4

ENHANCING THE PUBLIC HEALTH INFRASTRUCTURE: A Prescription for Renewal

Chapters 2 and 3 have shown how and why the infrastructure that supports the delivery of public health services in Canada is fragile and uneven. Canadians must be able to rely upon public health to protect them from hazards to health, known and as-yet-unknown, while providing the full range of public health services. Some phenomena are predictable (e.g., "flu season"), but most public health threats are unpredictable in their timing and location. As the SARS episode has demonstrated, they can also be unpredictable in their nature. The structures and processes required to enable core public health functions constitute the public health infrastructure [PHI]. This infrastructure is analogous to personal health services, where clinical interventions such as surgery and drug therapy require an infrastructure of hospitals, doctors, nurses, equipment, medical schools, a pharmaceutical industry and so on. Hence, in this chapter, we consider the nature of the PHI and recommend strategies for renewing it at the federal, provincial/territorial, and municipal levels.

4A. Core Elements of the Public Health Infrastructure

The PHI schema set out below is similar to that used by the CDC. The first three categories apply across the system at the local, P/T and national levels.

a. Organizational Capacity

- Agreed strategies to maintain the capacity of the public health system, to effect improvement in major health issues, to set priorities and make strategic investments.
- Modern legislation, harmonized across jurisdictions.
- Defined essential functions, programs and services.
- An effective governance structure to ensure clear decision making authority and public accountability, that ensures clarity of roles and responsibilities within a systems-wide perspective, and maximizes resources to achieve public health objectives.
- Visibility for, and leadership of, the public health community and effective communication with the public.
- Mechanisms to consult and undertake collaborative planning to develop national strategies for important public health issues.
- Mechanisms to support non-governmental organizations and to consult with them.

b. The Public Health Workforce

- Appropriate number of staff.
- Standards for qualifications and competencies.
- Health human resource planning for public health.
- Accessible and effective training programs in a number of formats.
- Lifelong learning and career-development opportunities.

c. Optimal Business Processes and Information and Knowledge Systems

- Defined, optimized and agreed programs and business processes, including a streamlined and enhanced capacity to assist with the management of outbreaks of disease and threats to health, including linkages to clinical systems.
- Standards and best practices.
- Research related to population and public health.

- A central resource for knowledge translation and evidence-based decision-making, including the identification of research needs.
- Evaluation of population and public health programs.
- An information infrastructure, including information architecture, models and standards, technology transfer, privacy and information management, development of data sources, and system development.

To these three categories one can add a fourth category of functions that fall naturally to the national level. These include highly technical or scarce expertise, facilities or equipment that constitute a specialized reserve or surge capacity that is best provided or organized nationally, and formal international liaison activities. The federal public health function is a participant in the first three categories, and the provider of the fourth.

d. National Strategic Capacity

- Continuing national resources
  - technical assistance
  - development of technical protocols and practice guidelines
  - reference laboratories
- Specialized surge capacity
  - personnel
  - materiel
  - logistics assistance
  - management and/or coordination of outbreaks and emergencies
- International
  - liaison with, and reporting to/from foreign countries and international organizations

This schema illustrates first and foremost that there are no great mysteries in the organization of an effective public health system. Most of these functions are self-explanatory. Rather than elaborate on all of them here, we shall focus on a few general and critical functions. Additional detail on outbreak management, disease surveillance, laboratories, and health human resources follows in the next chapters.

4B. A New National Public Health Focus

4B.1 General Considerations

Many submissions from health stakeholders have called for a revitalization of the public health organization at the national level and the creation of a professionalized extra-governmental centre of expertise. For example, the Canadian Medical Association has recommended the "creation of a Canadian Office for Disease Surveillance and Control as the lead Canadian agency in public health, operating at arm's length from government." The Canadian Public Health Association reported on consultations showing "that the critical first step must be to increase current front-line public health capacity and to establish a National Public Health Agency." The Canadian Infectious Disease Society also favoured a "CDC North" with a specific mandate for infectious disease prevention and control.

We have seen above that a national agency for public health is a common pattern in other countries of the Organisation for Economic Co-operation and Development [OECD]. The Population and Public Health Branch [PPHB] of Health Canada currently operates many of the core federal public health functions for Canada. Its organization chart (see Appendix 4.1) includes multiple centres, some headquartered outside of Ottawa. In suggesting a major restructuring of Branch activities, the Committee intends no disrespect to the culture or accomplishments of Health Canada or the federal public service in general. However, the current placement of public health functions within a department of government puts public health professionals inside a very large organization and a highly process-oriented culture with a particular orientation to the political issues of the day. One advantage highlighted by many commentators has been the transparency and enhanced credibility arising from a clearer distinction between scientific advice on the one hand, and policy-making within Health Canada and Parliament on the other. A new agency could also provide expert advice to regulators in areas such as food safety, environmental hazards, and therapeutic products.

The processes by which policy is developed and communicated may be suboptimal for the provision of specialized public health services or even advice on regulatory matters. Whereas the scientific process demands a relatively free flow of information, governments tend to seek control of communications and aim for a somewhat hierarchical policy function leading towards the ultimate democratic authority—Parliamentary debate and decision making.

Some observers believe that one organization cannot discharge both functions concurrently; rather, these streams should be brought together by building stronger bridges between the distillers of evidence and the framers of policy. Moreover, a service orientation and collaborative culture are essential if the new national agency is to fulfill the mandate that Canadians rightly expect of it. These attributes are at least partially distinct from other policy-making functions.

The Committee believes scientists and professionals would find an arm's-length public health agency more attractive as a place of employment. An agency would enjoy greater flexibility in developing cooperative or contractual arrangements with academic institutions and other private partners, thus facilitating research and enhancing access to first-class talent. Agency status might also provide for a longer time horizon and greater stability of funding, with less risk of diversion of funds to other purposes.

The creation of an agency cannot depoliticize traffic among jurisdictions, but it could reduce the chances that the health of Canadians would inadvertently be held hostage in a jurisdictional disagreement among levels of government. An agency standing outside government and led by a public health professional could find new ways to engage public health professionals in the provinces and territories, and re-energize the public health workforce. Creation of an agency would also bring the delivery of public health services in line with public health in many other countries.

By analogy, personal health services themselves are generally not delivered directly by federal or provincial governments. They are devolved to a vast number of individuals, institutions, and agencies. We see potential for better partnership with personal health service providers through a new public health agency, particularly given the sometimes acrimonious interactions around health care at F/P/T tables in recent years. An agency would also provide some continuity of leadership and insulate public health functions from the lamentably short terms in office of senior F/P/T health officials and health ministers during the last decade.

4B.2 What Does 'National' Mean?

The lexicon of Canadian F/P/T politics, and the need to reinforce public health infrastructure at all levels of government lead logically to consideration of two options for a national agency. One is an F/P/T agency, accountable to federal, provincial, and territorial representatives. This is the model endorsed by the Council of Chief Medical Officers of Health. The other is a federal agency, more closely resembling the USA's CDC.

We begin with F/P/T agency options. One current example is the Canadian Institute for Health Information [CIHI]; it has blended F/P/T funding and governance. Albeit structured as a non-profit corporation, the Canadian Blood Services [CBS] is another distinct variant. It is P/T-governed and-funded, with the federal government acting as the national regulator for the agency. Creating any such agencies would involve difficult and time-consuming negotiations that could exacerbate existing tensions at F/P/T tables. CIHI has a more limited service mandate and much smaller budget than would be encompassed by the existing public health functions. The F/P/T agency option would also blur lines of accountability. As Prof. Kumanan Wilson[1] advised the Committee, the CBS model has other drawbacks. It has been criticized by provinces for importing the US problem of unfunded federal mandates to Canada, because it couples national regulation to provincial supply and payment. Even assuming new federal funds to cost-share the operation of a P/T-governed national agency, and federal regulations to create consistency of operations across provinces, this variant seems wholly impractical. In general, the F/P/T agency option is not compatible with calls for clarity of roles along with renewed federal and provincial strength in public health.

SARS has nonetheless underscored for Canadians the need for coordination of functions in areas such as disease surveillance, outbreak management, and emergency response. These areas inescapably involve a roll up of activities from the municipal or regional to the provincial, interprovincial, and federal levels. We shall return to these points in Chapter 5. For now, the Committee will simply highlight the logical appeal of an F/P/T network structured to reinforce and help coordinate disease surveillance and outbreak management on a truly pan-Canadian basis, linked to the work of the successful F/P/T network that is already operating in the realm of emergency preparedness and response. A new infectious diseases network would need earmarked funding that could flow from a federal agency to provincial centres and agencies on an equitable, transparent, and strictly mission-oriented basis. It could become a bulwark against new threats such as SARS. Such a network, however, requires a strong federal node that can pull its weight in disease surveillance, outbreak management, and emergency response. And, for reasons given in Chapter 3, the federal government must be positioned to work more generally in support of provincial and municipal public health programs. To these ends, the Committee endorses the creation of a new federal public health entity which, for ease of reference, we shall term the *Canadian Agency for Public Health*.

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[1] Interested readers can find more information on Wilson's work on federalism at http://www.iigr.ca/publication/detail.php?publication=301 (accessed on August 21, 2003).

4B.3 The Structure of a New Federal Agency for Public Health

The Committee considered some options available in the current machinery of government.

A **Crown Corporation** offers substantial independence from the financial and personnel controls that accompany departmental administration. The enabling legislation for each Crown corporation sets out the corporation's mandate, powers and objectives. Crown corporations are accountable to Parliament through assigned responsible ministers. The federal government retains power and influence over Crown corporations through: i) the appointment and remuneration of directors and chief executive officers; ii) directives and regulations; and iii) approval of corporate plans and budgets. The Committee concludes that a Crown Corporation removes the new agency too far from Parliament and government—a point of concern given the need to ensure integration of public health activity with a wide variety of departments, not least Health Canada itself.

Special Operating Agencies [SOA] are designed to balance controls (and risk avoidance) with encouragement of innovation and initiative. SOAs support a set of values—including innovation, enhanced authority at the front line, client-centred operation, self-regulation, better management of people and accountability for results—which will lead to greater efficiency of operation and improved service quality. SOA examples include Technology Partnerships Canada, Training and Development Canada and the Canadian Heritage Information Network. SOAs are not independent legal entities, and are established on the basis of Treasury Board approval. We reject this option on the grounds that SOAs remain part of, and accountable to, their home departmental organization, with preservation of all existing labour relations.

Departmental Service Organizations are operational units or clusters of units within a department. They are organized to deliver services to the department's clients. Like SOAs, they operate within a management framework approved by the deputy minister and the Treasury Board, but may represent a larger share of the department's overall activity than a typical SOA. No separate legislation is required. Environment Canada's Meteorological Service is the only such organization in existence. Again, this option does not provide the required independence or opportunity to integrate activity from multiple departments.

Separate (statutory) agencies, also known as **Legislated Service Agencies** [LSA] or Departmental Corporations, provide a fourth option. Included in this category are the Canadian Food Inspection Agency, the Canadian Institutes of Health Research, Statistics Canada and the Canada Customs and Revenue Agency. These are mission-driven organizations established by specific legislation to manage the organization and delivery of services within the federal government. They typically perform administrative, research, supervisory, advisory and/or regulatory services of a governmental nature. Legislation sets out the framework under which each agency will operate including its mandate, governance regime, powers and authorities, and accountability requirements.

Separate agencies differ only slightly from each other. They have the following common characteristics:

- headed by a chief executive officer [CEO] reporting directly to the Minister;
- supported by a "Board" with members appointed by the Governor in Council;
- subject to Ministerial direction;
- separate employer under the *Public Service Staff Relations Act* (e.g., increases staffing authority/flexibility);
- managed on the basis of a corporate business plan;
- focus on performance and accounting for results;
- greater financial and administrative authorities than traditional departments, e.g., ability to enter into partnering/licensing arrangements and can obtain non-lapsing spending/revenue retention/re-spending authority; and
- oversight by the Auditor General and subject to the *Official Languages Act*, *Privacy Act* and *Access to Information Act* and Federal Identity Program requirements.

As one example, the Canadian Food Inspection Agency [CFIA] has some powers/authorities that distinguish it from a "typical" department. These are listed for reference:

1. Separate employer (e.g., authority to appoint from outside of the public service, full control over classification, collective bargaining, pay and compensation);
2. Can set its owns fees and sell assets/services, e.g., training, accreditation, intellectual property, and retain revenue;
3. Funded through parliamentary appropriations but can spend/carryover for two years at a time;
4. Enhanced F/P/T collaboration mechanisms, in that the Agency can
   a. delegate inspection/quarantine powers to P/T public servants and private sector specialists;
   b. enter into agreements with one or more P/T governments for the provision of services; and
   c. create F/P/T corporations to carry out joint activities in a more "integrated" fashion;
5. Choice of service providers, e.g., legal, property management services; and
6. Increased contracting authority.

Even a cursory review of these characteristics underscores the rationale for the Committee's recommendation that the new federal public health agency be structured as a legislated service agency.

The relevant legislation could be relatively skeletal with a view to timely passage. It would presumably include appropriate and consolidated authorities to address public health matters where the federal government is expected to provide leadership and action, such as national disease outbreaks and emergencies, with or without additional authorities regarding national disease surveillance capacity. Spending authorities, however, would need to be determined and specified, especially given the need for the Agency to use financial transfers as a means of strengthening infrastructure and collaboration on a truly national basis.

On the human resources side, it seems desirable for the organization to have the authorities of a separate employer under the *Public Service Staff Relations Act* to allow it to address unique recruitment and retention challenges in an environment of global competition for scarce scientific and public health expertise. Two other desirable features of agency status are the ability to use a 24-month financial horizon, thereby escaping the perverse cycle of year-end spending that persists in Ottawa, and enhanced flexibility in selecting providers in areas such as information technology, legal services, and property management.

The new **Canadian Agency for Public Health** would report through its director to the Minister of Health. The Minister would be ultimately responsible for the agency, as occurs with the US CDC. The legislation would provide appropriate powers for delegation of ministerial authorities to officials. The Minister would continue to give policy direction to the agency and obtain any information required to provide appropriate ministerial oversight, direction and accountability. However, we envisage that the agency would have a strong internal priority-setting process and a clear strategic focus in its own right. In other words, the new agency would have meaningful autonomy as contrasted with, say, the relationship between Finance Canada and the Canada Customs and Revenue Agency today.

The constituting legislation might also include legal authorities to access and use sensitive data sourced from public and private sectors for public health purposes, creating a data enclave as exists for Statistics Canada. Indeed, the public health data enclave might be a 'Swiss bank' within Statistics Canada itself. Absent such authority, and given problems with extant privacy legislation as will be outlined later, the agency may have difficulties balancing the appropriate protection of privacy with its performance expectations.

As the agency would be part of the Health portfolio, the Government would need to clarify and establish the appropriate roles and responsibilities of Health Canada, as a department, in relation to the agency. We return to the specific question of agency scope below.

The agency would receive an annual appropriation from Parliament, and be subject to Parliamentary scrutiny in the same manner as for departments. That is, the Auditor General of Canada would provide oversight of the agency's financial statements and performance, including an assessment of the fairness and reliability of the performance information contained in the performance report to Parliament. The Institute would also be subject to all legislation governing departments, such as the *Official Languages Act*, *Canadian Human Rights Act*, *Access to Information Act* and the *Privacy Act*.

4C. A Chief Public Health Officer for Canada

The Committee received a number of recommendations for the creation of a professionally-qualified leadership role in public health at the national level. This is variously described as a Surgeon General, National Public Health Commissioner, Federal Chief Medical Officer of Health, or Chief Public Health Officer of Canada. Among the many stakeholder groups endorsing variations on this theme were: the Council of Chief Medical Officers of Health, the Canadian Medical Association, the Canadian Federation of Nurses Unions, the Canadian Association of Emergency Physicians, the Canadian Public Health Association, and the Association of Canadian Academic Healthcare Organizations.

Other countries have established similar positions. In the UK, there are Chief Medical Officers for England, Scotland, Wales and Northern Ireland; and the UK's Health Protection Agency is headed by a public health physician. In the USA, the Surgeon General and Director of the Centers for Disease Control and Prevention are both health professionals.

The Committee has considered different options regarding this position. One would be to create a Surgeon General or 'auditor-general for health' who is arm's length and apolitical. This public health watchdog could report directly to the Minister as in the UK. A second and related option would be to establish the position as an officer of Parliament. Officers of Parliament are generally those who have cross-cutting functions related broadly to government and governance. This does not square fully with the public health role. In either case, the problem is that such an office would have moral authority but little else. An alternative option would be to create the role, but nest it within an existing or new structure. For example, in a new agency, a senior professional could be the Chief Public Health Officer, analogous to the Chief Veterinary Officer of Canada who reports to the director of the CFIA. This is feasible, but again could leave the Chief Public Health Officer in a rather awkward position as regards independently raising issues of broad concern for public health.

If the Chief Public Health Officer were also to be the chief executive of the new federal agency for public health, then he/she has a logical position of advocacy and leadership, and the tools to advance an agenda of change. We acknowledge potential conflicts of interest in the dual role: i.e., the Chief Public Health Officer has an interest in ensuring that the agency is perceived to be discharging its responsibilities effectively. However, given the visibility of the agency, appropriate ministerial oversight, and—as described below—the creation of a National Public Health Advisory Board, this conflict can be mitigated.

Protections for the independence of the Chief Public Health Officer can be devised that are analogous to those in various provinces or territories. In urgent situations where the health of their respective public is threatened, a P/T health officer often has independent authority to notify the public and advise on measures necessary for public protection. Specific provincial examples exist for protection of the independence of chief health officers. In British Columbia, the Provincial Health Officer has the power to report directly to the legislature:

> *If the Provincial health officer considers that the interests of the people of British Columbia are best served by making a report to the public on health issues in British Columbia, or on the need for legislation or a change of policy or practice respecting health in British Columbia, the Provincial health officer must make that report in the manner the Provincial health officer considers most appropriate... Each year the Provincial health officer must give the minister a report on the health of the people of British Columbia including, if appropriate, information about the health of the people as measured against population health targets, and the minister must lay the report before the Legislative Assembly as soon as practical. (Health Act, ch 179, 2.3 (3) & (4))*

In Manitoba, as a result of a review by the Ombudsman of events surrounding a delay in notification of the public, the employment agreement between the province and the Chief Medical Officer of Health states:

> *While accountable to the Department, the Chief Medical Officer of Health may function autonomously when necessary in the interests of the health of the public. Under these circumstances, the Chief Medical Officer of Health has the authority to issue public health advisories and bulletins, or take other actions. The Chief Medical Officer of Health will inform the Deputy Minister and/or the Minister prior to such actions or as soon as practically possible, in accordance with established protocols. (Schedule "I", (12))*

In short, appropriate safeguards for the independence of the **Chief Public Health Officer of Canada** can be set in place without compromising her/his accountability as an agency director.

The Chief Public Health Officer of Canada would be a leading national voice for public health, particularly in outbreaks and other health emergencies, and a highly visible symbol of a federal commitment to protecting and improving Canadians' health. She or he should obviously be trained and adept in crisis communications. The Chief Public Health Officer of Canada should be required to report to Parliament on an annual basis on the state of public health, and given authority to make a special report to a special parliamentary committee on any matter of pressing importance or urgency that should not be deferred.

Additional duties of the Chief Public Health Officer of Canada could include:

- to protect and advance the health of Canadians by advocating for effective disease prevention and health promotion programs and activities;
- to articulate scientifically-based health policy analysis and advice to the federal minister of health and, as requested, provincial and territorial ministers of health, on the full range of critical public health and public health system issues;
- to provide leadership in promoting special health initiatives, (e.g., relating to health inequalities, childhood injuries, Aboriginal health) with governmental and non-governmental entities, both domestically and internationally; and
- to elevate the quality of public health practice in the professional disciplines through the advancement of appropriate standards and research priorities.

4D. Scope of the Canadian Agency for Public Health

Public health agencies, centres, and institutes around the world vary greatly in their scope. It is premature for the Committee to recommend exactly which activities and programs should be included at this point, beyond indicating our support for a strong and integrative organization. Instead, a systematic review of the scope of the new agency is needed. While there is also an option to have two, or more, agencies, as in the UK, we endorse a unitary structure. A list of areas for inclusion follows, together with a table indicating which activities fall within the scope of particular centres or agencies in different jurisdictions.

1. infectious disease, prevention & control
2. microbiology reference laboratories
3. emergency preparedness & response
4. chemical exposures
5. poison control
6. environmental health
7. chronic disease prevention & control
8. injury prevention & control
9. perinatal & child health/human development (programs)
10. health promotion grants
11. tobacco control
12. drug control
13. screening
14. occupational health
15. food protection
16. radiation protection
17. knowledge translation
18. research
19. infostructure
20. international collaboration

Agencies	Components
BC CDC	1, 2, 4, 5, 6, 12, 15, 16, 18, 20
Quebec's National Institute of Public Health	1, 2, 4, 5, 6, 7, 8, 9, 11, 13, 14, 18 20
New Zealand Institute for Environmental Science Research	1, 2, 4, 6, 18, 19
U.K. Health Protection Agency	1, 2, 3, 4, 5, 18
U.K. Health Development Agency	9, 17
European Centre for Disease Prevention & Control	1, 3
Finland: National Public Health Institute	1, 2, 6, 11, 18
Sweden: Institute for Infectious Disease Control	1, 2, 18
Norwegian Institute of Public Health (Folkehelseinstituttet)	1, 2, 18
U.S. Centers for Disease Control and Prevention	1, 2, 3, 7, 8, 9, 11, 12, 13, 17, 18, 19, 20
Canadian Food Inspection Agency	15

In Canada, a range of government departments and agencies engage in public health activities, including the Canadian Food Inspection Agency, Canadian Customs and Revenue Agency, Citizenship and Immigration Canada, Indian and Northern Affairs, and Environment Canada. In each of these cases, a working relationship exists with Health Canada. This division of roles may not be uniformly optimal. As one example, the area of environmental impacts on health has been seriously neglected in Canada and requires urgent investment; we envisage this as a program of activity that must be supported by the new agency.

Specific programs within Health Canada also deal with non-regulatory aspects of tobacco and nutrition. One view is that these functions should stay linked to the corresponding regulatory activities; another would argue that they should be rolled into the new agency. The Committee believes that regulation of food, pharmaceuticals, therapeutic products, pesticides, or consumer products should remain outside the mandate of the agency. While its work should inform the regulation of environmental hazards, and occasionally generate expert advice for federal regulatory functions as listed, the agency would not be expected to deal with the mechanics of regulation. For reasons that will be outlined in the next chapter, the Committee envisages that the Centre for Emergency Preparedness and Response would be sited in the new agency, albeit with continued cross-linkages to other departments throughout the federal government. The new agency should create opportunities to engage in activities that currently receive less attention in Health Canada than might be deemed ideal, such as injury prevention and control and mental health.

Zoonoses are of special interest to the Committee, for obvious reasons. The SARS coronavirus is simply the latest in a growing number of viruses that are believed to have moved from animals to humans with devastating effects in recent decades. Currently, the Chief Veterinary Officer of Canada works within the CFIA, serving as Executive Director of the Agency's Animal Products Division, with responsibility for administration of the *Health of Animals Act*. More specific responsibilities include surveillance systems, certifying that Canada is free of the International Organization for Epizootics (usually known by the French acronym, OIE) "A" list diseases, representing Canada internationally, and helping to manage veterinary epidemics of notifiable and reportable diseases.

At risk of oversimplification, one can say that the CFIA would consider an animal disease part of its mandate if it led to a food safety or food trade concern, or if it were legislated to be responsible for a disease. This leads to the odd situation whereby rabies and equine encephalitis (which are human health risks, but of little food safety concern) are considered part of the CFIA mandate because of legislation, whereas West Nile virus (a human and animal health concern but not a food safety issue) is outside of its mandate. As outlined in a submission from the Canadian Veterinary Medical Association [CVMA], veterinarians collaborate across federal, provincial, and territorial governments, and extensive lists of notifiable and reportable animal diseases are maintained and updated. The CVMA states, "Despite the extensive animal disease surveillance programs, there is no direct link with public health care programs; not at the national level, the provincial level, or at the local level...There is a much clearer role for veterinarians defined in federal statutes for animal disease control, and particularly for Reportable diseases, than seems to be the case for human health."

Zoonotics do have coverage within existing Health Canada structures. These include the Food Safety and Zoonotics Division within the Centre for Infectious Disease Prevention and Control, the Laboratory for Zoonotics and Special Pathogens at the National Microbiology Laboratory and the Laboratory for Foodborne Zoonoses in Guelph. Nonetheless, the new agency will clearly need to develop strong partnerships with academic veterinary medicine and the veterinary practice community in Canada. In this respect, the Committee notes that the 1994 Lac Tremblant report recommended that the government of the day should "[a]ddress zoonoses, such that an effective means of information sharing be established between all the interested groups (i.e., veterinary medicine, Agriculture Canada, regulatory bodies, Canadian Cooperative Wildlife Health Centre, public health)." Progress has been made, but more is needed.

As noted above, another function that should be strengthened and vested at least partly with a new agency is the production of an annual report on the health status of Canadians, as well as other reports focused on specific aspects of population health from time to time. Currently CIHI produces an annual report on the health of Canadians. This information and the related analytical capacity are essential for the new agency in setting targets and working towards them collaboratively with the provinces and territories.

We have deliberately left an issue of great importance for final comment in this section. The health status indicators for Canada's First Nations and Inuit peoples are dramatically worse than those for the majority populations. These health status disparities are a national disgrace. They exist for a variety of infectious diseases as well as non-communicable illnesses. Addressing them requires a wide-angle approach to health determinants and community development that must clearly be integrally supported and guided by the affected Aboriginal communities. A continuing challenge in mounting appropriate responses is a recurring tension between the right and aspirations of Aboriginal peoples to greater self-determination within the Canadian federation, and the uncertain effectiveness and efficiency of reinforcing the extant pattern of separate health systems for First Nations and Inuit communities. Early in its deliberations, the Committee made a strategic decision not to move into this difficult terrain, believing that a superficial verdict would do more harm than good, and that the field was best left to general assessments with a longer timeline such as the one now underway by the Standing Senate Committee on Social Affairs, Science and Technology, chaired by Senator Michael Kirby.
At this point, we shall say only that the scoping exercise for the new agency must be informed by a careful review of public health service provision and health promotion for First Nations and Inuit Canadians.

4E. A Federal Agency with a Pan-Canadian Orientation

Jurisdictional ambiguities and tensions have long bedevilled public health activities and programs as well as personal health services in Canada. Chapter 9 reviews how the federal government might work with the provinces to clarify some of these jurisdictional ambiguities and strengthen its legislative role in public health as part of the omnibus review of health legislation that is underway. However, attempts at unilateral centralization of authority in a fragile federation with a complex division of powers and responsibilities are generally a prescription for conflict, not progress. Measures to create collegiality, consensus, and commonality of purpose can lead to collaborative work that overcomes jurisdictional tensions. Indeed, as already stated, part of the rationale for a new agency is to remove it some distance from F/P/T fault lines. We accordingly review here some of the features of the agency that would give it a national rather than federal flavour and orientation. Three salient features are the distribution of the functions of the new agency, creation of what we term, after the Australian precedent, the Public Health Partnerships Program to flow funds to provinces, territories and municipalities in support of front-line public health functions, and the appointment of a National Public Health Advisory Board drawing on an F/P/T nomination process.

4E.1 One Agency, Many Locations

Health Canada currently operates a system of regional offices, with the headquarters of the Department in Ottawa at Tunney's Pasture. Few of the core functions of PPHB are sited in these regional offices, and their connections to provincial and municipal health agencies vary from one office to the next. We see little merit in spreading agency staff through these offices. On the other hand, PPHB does have major foci outside of Ottawa. Particularly pertinent given the Committee's mandate are the National Microbiology Laboratory in Winnipeg, Manitoba, and the Laboratory on Foodborne Zoonoses in Guelph, Ontario.

The Committee does not believe that the agency should be centralized in a single new location. This would involve a transition from the current arrangement, be disruptive for staff, and fail to capitalize on the full range of opportunities for partnership in P/T and municipal jurisdictions. We assume, moreover, that there will be some expansion of core functions in Ottawa, aligned with the funding recommendations and national public health strategy (see below). But the agency must be seen to reach across Canada in tangible and visible ways.

There accordingly exist two logical options. One is to concentrate on specific locations for establishing or expanding agency functions that reflect the current geographical siting of PPHB. The other is to expand judiciously some of the existing sites and deliberately devolve some existing or new functions to new locations across Canada. In this latter vision, which the Committee endorses, an explicit effort would be made to delineate regional hubs (for example, in Vancouver, Edmonton, Winnipeg, Toronto, Quebec City and Halifax) that could each offer a specialized national resource, differentiated in support of the entire system (such as exists in Winnipeg with the National Microbiology Laboratory).

In the next chapter, we outline our recommendation for a national network of centres for infectious disease control, predicated on a provincial/regional hub system as recommended by the Canadian Public Health Association, and building on strengths by involving P/T, academic, and possibly other partners. Even without details about the network concept, one can imagine a fully developed system in which each regional centre has two components, both bolstered by partnerships with local academic centres, the relevant municipal health agency, and other stakeholders:

1. A regional centre focused on infectious disease surveillance and outbreak management, with F/P/T funding, networked into a national steering committee, and reporting to a director appointed under specific P/T authority (either on a single jurisdictional or multi-jurisdictional/regional basis). Federally-funded personnel could work in the P/T regional centre (or elsewhere in municipal or provincial public health agencies) as part of a system of strategic secondments within a national public health service.
2. A specialized federally-funded and administered centre, serving as a national resource, led by a director within the new federal agency, and reporting to the Chief Public Health Officer of Canada.

In the best of all worlds, activity in these regional hubs would become mutually reinforcing, with the emergence of a common culture dedicated to protecting the health of Canadians. Regional specialty centres within the new agency might supplement some of the technical support functions of P/T ministries. For example, public health laboratory functions could logically be rolled into a P/T regional centre for infectious disease control. If a federal laboratory were to be developed as a specialized resource and co-located, sharing of infrastructure and supplies would make sense. These hubs would be ideal settings for applied research, with both practitioners and academics involved in joint research programs. They would also be excellent settings for various types of training programs.

Last, some specialized federal resource centres may in themselves operate on a networked basis. While this reduces critical mass for regional hubs and F/P/T synergy, the network approach may have other advantages.

The key, in all cases, is to avoid building an empire at Tunney's Pasture and create a new culture of outreach, partnership, and excellence. As regards partnerships, any new agency must consult widely with stakeholders in the broader health community, including the voluntary sector and service provider associations and unions, to ensure that the energy and creativity of non-governmental organizations [NGOs] is usefully harnessed.

4E.2 A National Public Health Advisory Board

The Committee also envisages the prompt creation of a **National Public Health Advisory Board**. This Board would advise the Chief Public Health Officer of Canada on the most effective means to create and implement a national public health strategy that reinforces pan-Canadian collaboration so as to protect and enhance the health of Canadians. The Board would be chaired by a distinguished Canadian prominent in the health sphere; its membership must reflect Canada's geographic, cultural and linguistic diversity, as well as the range of disciplines and stakeholders in public health. International representatives prominent in public health would be included on the Board.

To maintain appropriate and clear lines of authority, the agency and its chief executive must report to the Minister; the Board is therefore not a board of directors in the usual sense of corporate governance, but rather has an advisory and strategic role. Nominations could be solicited from existing F/P/T networks and advisory committees, as well as key stakeholders in the health sphere. In order to facilitate pan-Canadian collaboration and integration of public health functions with the broader health agenda, one option would be to stipulate that Board nominees must be vetted by the F/P/T Conference of Deputy Ministers of Health. In any case, members would be appointed to limited terms by the federal Minister of Health, and the Minister could ask the Board for input on the performance of the Chief Public Health Officer of Canada.

4E.3 A National Public Health Strategy

As noted in Chapter 3, many countries have coherent strategies with nationally-agreed health goals. These nations link legislation, programs, monitoring, standards, funding and accountability to a national strategy and objectives.

Canada currently lacks an overall strategic approach to the health field; this includes both public health and health care. Several stakeholder groups, including the Canadian Nurses Association and the Canadian Public Health Association, called for the creation of a national health strategy. This theme also emerged strongly from focus groups with front-line hospital staff and their unions.

Some provinces do have specific health goals. Sector strategies at the federal level also exist with varying degrees of collaboration for foci such as healthy living, cardiovascular disease, cancer and immunization. Further, provinces drawing on federal transfers and their own revenue bases will want to set their own public health priorities. However, the Committee sees overwhelming merit in a collaborative process to integrate existing strategies and forge an F/P/T consensus on goals. Canadian citizens deserve a national health strategy that includes specific health targets, benchmarks for progress towards them, and collaborative mechanisms to maximize the pace of progress. The Committee envisages a process whereby public health professionals from different levels of government and from major stakeholder groups should confer with a view to developing priorities, goals and strategies. Public health professionals from Ottawa, the provinces, the territories, and various non-governmental partners must also pursue strategies to address the surveillance info- and infrastructure, and human resources, topics reviewed in more detail in Chapters 5 and 7. New federal funding for public health should be explicitly tied to these strategies and plans, with process and outcome reporting as in the Australian model, and be structured as contributions that are subject to audit (see below).

The national strategy should include provisions for a coherent response across jurisdictions to outbreaks of communicable disease. Infectious disease/public health emergency plans should be coordinated one with another and tested in simulation. However, the strategy must not be limited to infectious diseases: the application of increased resources and new structures should facilitate the development and implementation of a broader national strategy to address causes of chronic diseases and injuries. More research, more research synthesis and better evaluation of health promotion and other programs are all necessary as part of any effort to enhance the effectiveness and efficiency of public health. And these strategies, in turn, would integrate the efforts of federal, P/T, and other stakeholders.

The Committee views communications as an integral part of a public health strategy, not a separate, stand-alone item. The scope for public education is substantial in many areas of disease and health promotion. For example, a national campaign—developed in partnership with a number of stakeholders—could be launched to enhance public awareness of the risks of various infectious diseases and encourage sensible new norms in behaviour, e.g., more frequent hand washing, avoidance of work while in the contagious phase of a respiratory illness, use of surgical masks to prevent droplet transmission of viruses, and care during illness with a respiratory or enteric virus to prevent potential contamination of fomites (an inanimate object that can carry disease-causing organisms) in the work or home environment. Increased engagement of key stakeholders in communicating with the public, before and during infectious disease outbreaks offers new opportunities to inform the public through additional, innovative communications channels (i.e., employers, unions, and industry sectors directly implicated).

4F. Funding to Strengthen Canadian Public Health Capacity

4F.1 General Considerations

Post-SARS, a rare consensus has emerged that more must be spent on public health by the federal, provincial, and territorial governments. Submissions and observers have provided suggested figures: all represent significant increases over current levels of funding. Given the many billions of dollars of extra funding per annum flowing to the acute care system as a result of two Health Accords, we have no hesitation in suggesting that it is time to redress the balance and invest an additional several hundred million dollars per annum in public health.

Although Health Canada's own operations require strengthening, this is not the only priority. New federal money must find its way to the front lines and to those activities which serve to strengthen the generic capacity of local and regional public health agencies to protect and promote the health of Canadians. The Committee's expectation is that provinces and territories recognize—indeed, will assert—their primary responsibility for those same services, and also generously augment their support.

The health human resource shortfalls and urgent need to bolster public health agencies in some municipalities and provinces make it essential that there be serious efforts in good faith at F/P/T coordination. The worst-case scenario would be one in which new funding served more to prompt bidding wars across jurisdictions and the movement of skilled public health personnel rather than building new capacity.

Obvious targets for early investment are surge capacity to deal with infectious outbreaks and other emergencies, a major program to build human resources in public health, reinforcement of the public health laboratory network (see Chapter 6), and creation of business process agreements to facilitate coordinated F/P/T responses to outbreaks. Immunizations, discussed in more detail below, are another target where money can be used quickly and well. The list could doubtless be extended in different directions by different parties. Regardless, appropriate prudence in ramping-up federal funding is warranted to ensure that investments meet strategic goals and that new federal monies do not simply displace existing public health commitments without much net gain.

4F.2 Funding the Core Agency Functions

As we saw in Chapter 3, the FY 2003 appropriation for the US CDC was C$10.8 billion (US$7.2 billion). Use of this US benchmark presupposes both a strengthened core function in a new federal agency and enhanced flow of funds to support P/T programs, given CDC's role in making diverse contributions to other levels of government. A direct comparison with federal spending in Canada is difficult given the fact that state and municipal public health infrastructure in the USA is arguably more uneven and the per capita expenditures at the local and regional level generally lower than in Canada after one discounts spending on personal health services for recipients of social assistance. Federal expenditures on public health in Canada in any case would need to increase several-fold to reach 1/10th of US expenditures suggested by the ratio of populations.

Another approach is to estimate the costs of strengthening and supporting public health infrastructure in Canada and focus on core functions already in existence or those functions such as disease surveillance where a new agency might reasonably be expected to take on a leading role. We have reviewed line-item estimates aimed at building a moderate level of infrastructure in the core agency over the long term, but these are rough estimates and the balance between lines would change over the years. These estimates did not include amounts necessary to galvanize capacity at the P/T level, and deliberately focused only on "narrow-definition public health" as outlined in Chapter 3, i.e., excluding the type of activities supported by the program of grants and contributions to NGOs, universities, and other partners that is currently operated by PPHB. (Enhancement of core activities would naturally involve such partnerships; the issue here is the function and its incremental cost, not the mechanism.) How do these estimates roll up?

A proper national surveillance system alone could add $40 million a year, assuming that costs are borne primarily by the federal government. However, as outlined in the next chapter, we are assuming that surveillance of infectious diseases will be largely financed by the agency through a separate allocation. This estimate can thus be reduced substantially as regards core functions, assuming synergy in infectious and non-infectious disease surveillance. Let us peg this new cost crudely at $15 million per year on the grounds that infectious disease surveillance systems are a top priority in the present circumstances, and the P/T jurisdictions will themselves be co-investing in infectious disease surveillance. Development of the national health strategy, creation of performance standards, and preparation of a report card to measure progress towards health goals could easily run $5 million a year. Enhancing health emergency preparedness and response, outlined in more detail in Chapter 5, adds at least $10 million per annum, rising by another $10 million if one considers the urgent need to create epidemic response teams and other health emergency response teams to provide public health and health services surge capacity. Defensible increases in spending to enhance infectious disease capacity within the agency could run $50 million if the federal nodes in a new network for communicable disease control (see Chapter 5) are to be credible and supportive partners. This includes costs of creating or improving business processes for surveillance and outbreak management, enhancement of federal laboratories, and some urgent capacity-building partnerships with provincial laboratories until new F/P/T investments come on line. Investments in health human resources are urgently needed. The agency must play a lead role in building human resources for public health, including primary training programs in partnership with colleges and universities, scholarships and bursaries, secondments, continuing education programs, and a greatly expanded field epidemiology service. This has been projected at $25 million per annum. Health Canada's internal investment in public health research and evaluation is seriously inadequate, particularly if the new agency is to be a leader in evidence-based public health practice or to partner effectively with the Canadian Institutes of Health Research [CIHR] and other research agencies provincially and in the non-profit sector. Another $25 million could be spent on R&D effectively in steady-state, particularly if the same monies go towards knowledge synthesis and guideline development. The coverage of areas such as environmental health, mental health, and injury prevention is clearly suboptimal and taken together, could draw an extra $30 million per annum.

Not all funding needs to be new. We see opportunities for public health to participate in programs already announced, such as the massive investment in the Canada Health Infoway, and perhaps even the 5-year $90 million fund for health human resources planning. But the tally above has already taken us to $170 million per annum in new spending. Furthermore, this list assumes that there are no new costs from institutional redesign, or new costs imposed by legislative and regulatory reforms. It assumes that Health Canada has already invested adequately in the existing programs that address healthy human development or chronic disease prevention and control. Both deal with exceedingly important areas in the public health portfolio—nothing less than, respectively, healthy beginnings to the lives of future generations of Canadians, and the great non-communicable scourges of our time such as cardiovascular disease and cancer. The list also assumes that if the scope of the new agency expands, the activities that are transferred in require no increases in budgets.

In the circumstances, we are recommending that the federal government budget for increases in core functions of a new federal agency for public health that will rise, over the next 3 to 5 years, to a target of $200 million per annum in incremental funding beyond that already spent in the "narrow" conceptualization of federal public health functions set out in Chapter 3.

How does this figure align with current spending? Recall from Chapter 3 that the core functions within PPHB currently amount to $187 million per annum (2002 budget). Allocating a portion of extant grants and contributions to this number, we reached $225 million as a rough estimate of core function costs in the Branch currently. We estimated, again crudely, that about $75 million of the costs of operations in other branches of Health Canada could be deemed to fall within this "narrow" range of public health activities. If the agency were simply to roll these functions together, exclusive of vaccine costs, then it would spend about $300 million per annum based on the 2002 budget. Thus, the proposed growth is about 60% over time to $500 million per annum for core functions. The growth becomes smaller in relative terms if one assumes that the scope of the agency broadens meaningfully.

We make this recommendation in light of an urgent need to enhance federal public health capacity, recognizing that it will go only a limited distance to narrowing the major per capita spending gap when aligning similar functions for Health Canada and USA's CDC. We also take note of the billions of dollars recently invested in personal health services, the staggering costs of the SARS outbreak, and the fact that $200 million per annum is about equal to the annual operating budget of a single large community hospital. In the circumstances, it seems minimally prudent to increase spending on core functions over 3 to 5 years, reaching a target of an additional $200 million per annum to ensure that Canada has an effective federal agency for public health protection and promotion.

4G. A New Public Health Partnership Program for Provinces and Territories

4G.1 Level of Funding

We have emphasized the need for funds to flow to the front lines where most outbreaks are contained and where public health does most of its good daily work in preventing disease and protecting the health of Canadians. Ideally, to determine the necessary funding, analysts would establish a reference level for required local and P/T programs and services based on a combination of expert consensus, established efficacy and cost-effectiveness/cost-benefit, and comparisons with other countries. They would then establish the gap between current reality and the reference level, and estimate the cost of closing that gap over a reasonable period of time. Such a process would be extremely time-consuming and is beyond the mandate of the Committee.

As noted in Chapter 3, incremental funding to bring all provinces up to the spending level in British Columbia would require an additional $408 million annually. However, the level of service in British Columbia cannot be assumed to represent the 'gold standard' for public health service delivery. As is evident internationally with personal health services, the boundaries for justifiable spending on public health are highly elastic given different community or societal tolerances for health risks and disparities. A crude $400 million figure also does not consider the potential differences in delivery costs due to geographically-dispersed populations or differing proportions of higher needs populations (e.g., health status, poverty, language, education, etc.), as well as the fixed systems costs independent of population size.

A second approach is to consider federal support for personal health care. The 2003 Health Accord provides $34.8 billion in additional funds for health care over a five-year period (2003-4 to 2007-8). If public health spending were pegged at not less than 3% of the personal health services spending through public channels, at least $1 billion in new public health spending should have been earmarked for public health over 5 years to keep pace with new personal services spending. And since the goal is to redress the balance in some measure and build greater F/P/T capacity, the new benchmark would need to be well above $200 million per annum for P/T transfers.

Other estimates of necessary spending are similarly approximate. We saw in Chapter 3 that the total spending on public health ranges from $2.0 billion to $2.7 billion, depending on whether the definition is narrow or broad. The provincial spending, based on rough estimates and projections, is $1.72 billion, inclusive of vaccine costs. If one assumed that over several years, there should on average be a 50% increase in P/T/Municipal core activities, the increased spending would amount to about $850 million per annum. One arbitrary point of reference is that the federal government should cover at least 50% of the increased P/T spending in its role as the primary revenue collector for Canada. This leaves half of $850 million or about $425 million as new and earmarked federal support. Provinces vary sharply in their ability to finance additional public health spending; and the proportion of federal funding in the extant $1.72 billion fell between 1977 and 2000 until the first Health Accord began reversing a trend to downloading of health costs onto P/T governments. Certainly it cannot be said that Ottawa is paying 50% of the existing P/T public health expenses. That said, the Committee again takes note of more than $30 billion in new federal monies to support provincial health spending vested in the second Health Accord.

We have therefore agreed that the total new federal contribution to P/T (and therefore local/municipal) public health funding can defensibly be set at $500 million per annum. This assumes that P/T governments themselves will make a greater allocation to public health over the next several years with the result that a much stronger F/P/T system will steadily emerge.

In the next chapter we shall outline how $100 million per annum of these new federal monies should be invested in infectious disease surveillance and outbreak management through P/T or regional structures. We also recommend that $100 million per annum be used to reinvigorate the National Immunization Strategy (see below). However, not less than $300 million per annum should be earmarked for a new Public Health Partnerships Program to strengthen general P/T public health infrastructure. The logical question then becomes: How should the funds flow?

4G.2 Programmatic Funding: Some Constitutional and Legal Considerations

The frustration with some of the jurisdictional issues in public health spurred a small chorus of informants suggesting that the federal government should enact new public health legislation to create national standards in areas such as disease surveillance and notification. Others called for the acceptance of tough new rules in exchange for new federal monies. The Committee supports the need to modernize the extant public health norms and legislation, and impose conditions on funding as occurs in both the USA and Australia. However, federal spending power has both advantages and limitations.

The federal government can transfer funds to individuals, institutions (e.g., hospitals), and other levels of government (provinces, municipalities). All are legally free to accept or decline the grant or contribution. Federal funds can be unconditional or conditional. It is well-established that conditional transfers have had the effect of influencing provinces to alter their policy priorities (e.g., by making health insurance universal). A strengthened infrastructure could therefore be created through the use of transfers that make provincial compliance with national public health norms or rules a prerequisite for federal funding. However, the provinces must agree to the conditions. In theory, if federal spending conditions were seen as disguised attempts to regulate provincial areas of jurisdiction, the courts might look favourably on a constitutional challenge. Moreover, the remedy in the event of provincial non-compliance with federal conditions is political and financial, not legal.

The Committee also heard suggestions from some informants that if the provinces did not cooperate with the development of a national infrastructure, the federal government should deal directly with municipalities and local health units, flowing federal funds to them in exchange for complying with federal standards on reportable diseases, timetables for reporting, etc. However, contractual obligations cannot bind third parties. A contract between the federal government and a municipality would not bind providers who report information to local public health officials, and municipalities generally do not have the power to impose data standards on providers outside the authority of the provincial public health branch. Furthermore, federal-municipal contracts could not bind provincial public health officials and institutions, and local public health officials are regulated by provincial statutes, which integrate them into provincial public health systems.

A more useful tool that is better suited to the nature of Canadian federalism, and the culture of collaboration that we believe must exist in public health, is the *Intergovernmental Agreement*. These agreements are often structured as memoranda of understanding and are "soft" policy instruments. Although they are sometimes drafted in legal language, they lack formal legal status. Memoranda of understanding [MOUs] between governments are a form of intergovernmental agreement. Intergovernmental agreements are a central feature of Canadian cooperative federalism. These documents range from the very general (e.g., the Social Union Framework Agreement [SUFA]) to the very detailed (which resemble contracts). The incentive to enter into these agreements is that they help to formalize and regularize relations between levels of government. Should a dispute arise, the terms of the agreement can be reviewed and conduct assessed against them. At the extreme, intergovernmental agreements could even require that certain provisions be entrenched in provincial legislation, to make them legally binding on provincial officials. The Supreme Court has nonetheless stated that intergovernmental agreements do not bind provincial or federal legislatures, which remain free to legislate in breach of intergovernmental agreements or to roll back legislation passed to operationalize an intergovernmental understanding. A number of federal-provincial MOUs are already in use in the public health sector. Consistent with practice in Australia and the USA, we see numerous areas in public health where MOUs could be concluded among F/P/T governments as a precondition to the flow of federal funds.

4G.3 Funding Instruments

Currently, the Government of Canada transfers funds to provinces and territories as a contribution towards the provision of insured health services on condition that they are provided according to the five principles laid out in the *Canada Health Act*. Provinces and territories fund the provision of these insured health services, as well as other health services, including public health. In Ontario, municipal governments are also responsible for contributing 50% to the cost of most public health services. Federal programs include the provision of advice and in-kind service for the prevention and control of infectious and non-communicable diseases, support for emergency response, public health services for select First Nations communities, and grants and contributions to NGOs as outlined earlier.

In thinking about how new funds might flow, one sees at once that the *Canada Health Act* cannot practically be revised to include public health as an insured service. The types of service are distinct, and the five current principles of the Act are not germane to public health with its population focus.

New public health funding for P/T functions might be separately transferred to provinces and territories on an otherwise unconditional basis for general public health purposes. Even if there were somehow a set of indicators to support the broad requirement that the money be demonstrably directed to public health, this approach would do little to reduce disparities, augment coordination, initiate a national public health strategy, create national surge capacity, or promote more uniform approaches to disease surveillance. It would also undermine Canada's position with international agencies such as the World Health Organization that are increasingly looking to nation-states for disease prevention or control in this era of globalization.

Another option would see tax points transferred to the provinces and territories so that they gain greater fiscal capacity to meet their public health needs. This has all the disadvantages of the previous option, and because of differential P/T ability to generate tax revenues, also augments disparities in per capita spending, as occurred with post-1977 personal health services spending.

Grants and contributions to local public health agencies, universities, professional associations, NGOs and other stakeholders might be provided to promote activities that strengthen public health services. This will occur as part of the roll-out of many aspects of a new national strategy. It may be particularly important for the federal government to consider more direct liaison with public health agencies in major municipalities such as Vancouver, Edmonton, Calgary, Winnipeg, Toronto, or Montreal. However, the first line of interaction should logically be with the level of government that, constitutionally, has primary responsibility for overseeing public health services. In short, transfers to non-P/T stakeholders make sense for specific activities (e.g., aspects of health human resource development), ideally with the full knowledge and support of P/T jurisdictions. (Because contributions are subject to full audit while grants are not, the Committee urges use of contribution agreements for transfers wherever possible.)

Another option suggested by some was general cost-sharing, e.g., the federal government would implement a specific formula for sharing the cost of public health services with the provinces and territories. This option requires a clear definition of the services and programs to be cost-shared, and runs the risk of displacing, rather than augmenting, spending. It would not address disparities, coordination or surge capacity.

Two other related options are the public health capacity foundation or a public health capacity fund. The first involves transferring a lump sum to an arm's-length corporation which would disperse funds to public health stakeholders. This would provide financial stability and allow for non-partisan solutions to specific challenges that are not policy issues. However, this option, similar to Infoway or the Canada Foundation for Innovation, has been criticized for a lack of accountability to Parliament, and has the disadvantage of failing to put public health on a continuing and stable footing. A public health capacity fund, similar to the Primary Health Care Transition Fund, would hinge on an F/P/T process to define public health programs to be funded. It would provide allocations to each P/T, and each jurisdiction would then use the funds to develop/maintain chosen activities within the overall program direction. This approach is more applicable to developmental projects, especially for information infrastructure and human resources, than to continuous funding of infrastructure. Furthermore, it requires advance agreement with all provinces and territories, yet the program needs of different P/T jurisdictions are highly variable.

Program funding, in contrast to all the foregoing approaches, has one massive advantage. It avoids creating another focal point for F/P/T tensions with a visible sum of money. Program funding is unabashedly targeted to the diverse needs of specific jurisdictions, but can simultaneously reinforce an agreed national strategy. In essence, the Committee envisages an explicitly depoliticizing strategy. We recommend placing the $300 million in the hands of the Canadian Agency for Public Health, and allowing a series of programmatic and *ad hoc* negotiations to unfold among F/P/T public health professionals who have the health of Canadians, rather than the vicissitudes of re-election, as their immediate and ongoing priority. The transfers would be structured as contributions and therefore open to audit. As noted in Chapter 3, we also recommend that the funds be allocated according to SUFA to avoid perverse incentives and penalties for early investments by P/Ts. A logical strategy would be to manage the entire $500M in new public health transfers as a single sum on this basis, providing greater flexibility to both the federal agency and P/T public health leaders in setting priorities. The earmarking of funds for an immunization strategy and an infectious diseases network would therefore not constrain province-specific flexibility. A province might balance out greater per capita participation for front-line public health in the new program with a lesser degree of participation in the federal funding for provincial infectious disease control. The majoritarian provisions of SUFA also preclude blocking of necessary national norms by one or two provinces that have a smaller stake in one or the other funding stream.

This option is used by the USA and Australia to improve public health infrastructure. Its critical characteristic is the ability to use funding as an instrument to direct activities according to an agreed plan. Funding for programs can be directed at, for example, information systems, laboratory capacity, training, recruitment and retention, emergency response capacity, developing P/T and local strategies and plans, among others. The programmatic option might also be combined in part with cost-sharing: some programs would offer a percentage of the cost, up to a maximum with the province or territory finding the balance. This option most closely aligns funding and policy direction, and reduces the risk of displacing existing spending.

We are therefore recommending the creation of a new $300 million Public Health Partnerships Program, modelled on precedents set by the Commonwealth Government in Australia and the US CDC. The Canadian Agency for Public Health would flow these funds largely through agreements with P/T public health officials, aimed at reinforcing core public health functions, collaborative arrangements, and local capacity for the full range of contemporary public health activity.

4G.4 Current Program of Grants and Contributions

Currently, more than half of PPHB's budget is for grants and contributions [G&C], flowing mainly to NGOs across Canada. Inside this $200 million G&C envelope are well-established programs covering a range of issues from communicable and non-communicable diseases to wellness and healthy living/aging. For example, among the programs is one to support a joint Health Canada/CIHR research initiative on Hepatitis C—a condition for which there is still no vaccine. Hepatitis C has infected an estimated 240,000 to 300,000 Canadians. Thousands of those infected develop chronic disease that could lead to death from cirrhosis or liver cancer. According to Prof. Mel Krajden, prior to the joint initiative there were only three funded hepatitis C researchers and very limited research occurring in Canada. The joint research initiative has catalyzed a substantial expansion in Hepatitis C research across Canada, much of it internationally competitive and already yielding results that can translate from bench to bedside. There is obvious value in investments of this nature and in a great many other G&C-supported activities.

Nonetheless, the Committee has heard mixed reviews of the existing G&C program, in part, we surmise, because spending on core functions has lagged and led to a sense of non-proportionality in the magnitude of transfers to NGOs. Concerns about politicization of grants and contributions were also raised, but we have no way of testing the validity of this innuendo. We recognize that many communities and community groups have benefited from this investment, and that it has multiplier effects through the NGO sector that are meaningful.

In her September 2001 report, the Auditor General comments on the management of these programs. Her team examined a sample of 38 projects from across Canada under three programs. The sample was selected because these projects covered the life course, were administered nationally and regionally, used sizable amounts of funds, and involved both grants and contribution agreements. Her report stated: "We are concerned about the significant number of our project reviews that identified problems in the project management process. In particular, we noted that the Branch did not subject high-value projects to a rigorous selection process, nor did it monitor those projects adequately..." In one of the program portfolios, the Auditor General noted that the Branch had identified problems with two of the projects, "but had failed to take timely action to resolve them... In the eight national and regional files on projects under $2 million, we found five cases that were not subjected to an adequate selection process and yet the Branch recommended them for approval..." In another program, the Auditor General found that six of the national projects were not eligible for funding based on the program's own guidelines: "Further, there was no evidence of communication with interested parties to invite project proposals; nor was there evidence of internal or external review or consultation with advisors. Yet all six of these projects were recommended and approved for funding" (totalling $15 million). Amendments to agreements are a further problem in that they are not subject to the same selection process as new agreements, and can be used to bypass selection and approval processes.

The Committee believes that the grants and contributions programs directed at various NGOs are valuable policy tools. The above-referenced concerns have more to do with management of the funds than the intrinsic worth of the investment. However, these expenditures should be reviewed to ensure that they reinforce and complement the Public Health Partnerships Program, and re-allocated if there are any issues about value-added in relation to a new national health strategy.

4G.5 Reinvigorating a National Immunization Strategy

The Committee's assessment of the status of the National Immunization Strategy offers another example of sound proposals to invest in public health that have received uneven and inadequate support by various levels of government. The Committee reviewed a series of documents dating back to the 1990s that show substantial diversity in the publicly-funded program and legislation pertaining to immunization and vaccination. As one example, not all children in Canada have received two doses of measles vaccine because some P/Ts could not afford to institute 'catch-up' programs in 1996-1997. Although the benefits of adolescent hepatitis B immunization were recognized a decade ago, Canada took seven years to reach national coverage because of variable uptake across P/T jurisdictions.

A proposal to strengthen collaboration on immunization was first presented to the F/P/T Conference of Deputy Ministers of Health in June, 1999. It was based on various concerns related to immunization in Canada, including escalating vaccine prices, concerns about security of supply, safety issues with some vaccines, evidence for growing inequity in access to newer vaccines, and uneven electronic recording of immunizations. Thereafter, a highly collaborative F/P/T process led to a proposal for a National Immunization Strategy. Those involved have not been able to achieve support for the vision of a fully-funded strategy, in which resources to purchase vaccines and secure their delivery would be guaranteed from coast to coast.

At present, provinces and territories remain responsible for finding the money to buy vaccines and deliver programs. This system continues to be criticized by expert informants and stakeholders alike. We understand that some suppliers offer provinces a package deal including various perquisites for health promotion. The current system compromises purchasing power, limits the security of vaccine supply, and puts providers in the untenable position of having to recommend vaccines to persons/families who often cannot afford them.

New vaccines are adding to the problem. Four new vaccines are currently unfunded in most P/Ts—conjugate pneumococcal vaccine, conjugate meningococcal vaccine, varicella vaccine and acellular pertussis vaccine. The estimated bill for Canada was expected to mount fairly rapidly to a steady-state of about $200 million per year for these new vaccines alone. Immunization experts from federal, provincial, and territorial jurisdictions proposed that the federal government pay for the new vaccines while P/Ts cover the costs of administration. To support their case, those involved produced documentation showing meaningful health and economic benefits from more complete coverage and upgrading of vaccination strategies. However, the F/P/T focus was instead on adding money to personal health services through the Health Accord.

The 2003 federal Budget acknowledged that immunization has been a remarkably effective preventive health measure. However, it provided only $45 million over five years ($5 million in year one, and $10 million a year thereafter) "to assist in the pursuit of a national immunization strategy." The Budget document claimed that the "objective of the strategy will be to ensure equitable and timely access to recommended vaccines for all Canadians in order to reduce the incidence of specific vaccine-preventable diseases." It further claimed that the national strategy would result in: "improved safety and effectiveness of vaccines; enhanced coordination and efficiency of immunization procurement; and better information on immunization coverage rates within Canada." In fact, notwithstanding this lofty objective and these anticipated results, the financial support in the 2003 Budget is nowhere near sufficient to catalyze a national immunization strategy.

The Committee believes that not less than $100 million per annum should be earmarked for a major reinvigoration of the National Immunization Strategy under the auspices of the new Canadian Agency for Public Health. Earmarked funds could be transferred to a purchasing body, e.g., Public Works and Government Services Canada, to purchase vaccines as agreed under the renewed strategy, so as to meet provincial and territorial needs. This would ensure that the funds go only for the agreed-upon vaccines, consolidates purchasing power and facilitates price reductions, and sets annual and national target volumes to ensure that industry can meet the needs of the nation. Furthermore, other branches of Government, such as Industry Canada, could use the vaccine investment to leverage private sector investment in vaccine research and development, as well as production in Canada. Working from an F/P/T consensus enhances inter-jurisdictional equity, by creating a "minimum agreed upon standard" for the introduction of new vaccines. Absent such consolidation, P/Ts have actually ended up competing with each other for available supply and on price as occurred with meningococcal vaccine shortages during outbreaks.

Also, in the absence of immunization registries in most jurisdictions, Canada is not in a position to provide reliable and accurate information on coverage levels. Our best information is that coverage with older vaccines, fortunately, is adequate. Thus, the focus of $100 million in incremental federal funding can be on new vaccines as well as improving the information systems to ensure that Canada meets an articulated health goal (and international norms) as regards vaccination coverage.

4H. Recommendations

The Committee recommends that:

4.1 The Government of Canada should move promptly to establish a Canadian Agency for Public Health, a legislated service agency, and give it the appropriate and consolidated authorities necessary to provide leadership and action on public health matters, such as national disease outbreaks and emergencies, with or without additional authorities regarding national disease surveillance capacity.

4.2 The Government of Canada should ensure that the scope of the Agency's mandate covers public health broadly with appropriate linkages to other government departments and agencies engaged in public health activities. The Government's scoping exercise for the new Agency must be informed by a careful review of public health service provision and health promotion for First Nations and Inuit Canadians.

4.3 The Government of Canada should budget for increases in core functions of the new Canadian Agency for Public Health that will rise, over the next 3 to 5 years, to a target of $200 million per annum in incremental funding beyond that already spent on core federal public health functions.

4.4 The architects of the new Canadian Agency for Public Health should ensure that its structure follows a hub and spoke model whereby links are made to existing regional centres with particular strengths in public health specializations while some other functions and new

ones are devolved to other regions of the country, with a vision that these parts support the entire system.

4.5 **The Government of Canada should create the position of Chief Public Health Officer of Canada. The Canadian Agency for Public Health should be headed by the Chief Public Health Officer of Canada who would report directly to the federal Minister of Health and serve as the leading national voice for public health, particularly in outbreaks and other health emergencies.**

4.6 **The Government of Canada should create the National Public Health Advisory Board, and ensure that nominations of board members come forward through provincial and territorial as well as federal channels. The mandate of the Board will be to advise the Chief Public Health Officer of Canada on the development and implementation of a truly pan-Canadian public health strategy.**

4.7 **The Canadian Agency for Public Health should play a catalytic role in developing a National Public Health Strategy in collaboration with provincial and territorial governments and in consultation with a full range of non-governmental stakeholders. The new Strategy should delineate priorities and goals for key categories of public health activity along with provisions for public reporting across jurisdictions of progress towards achieving goals.**

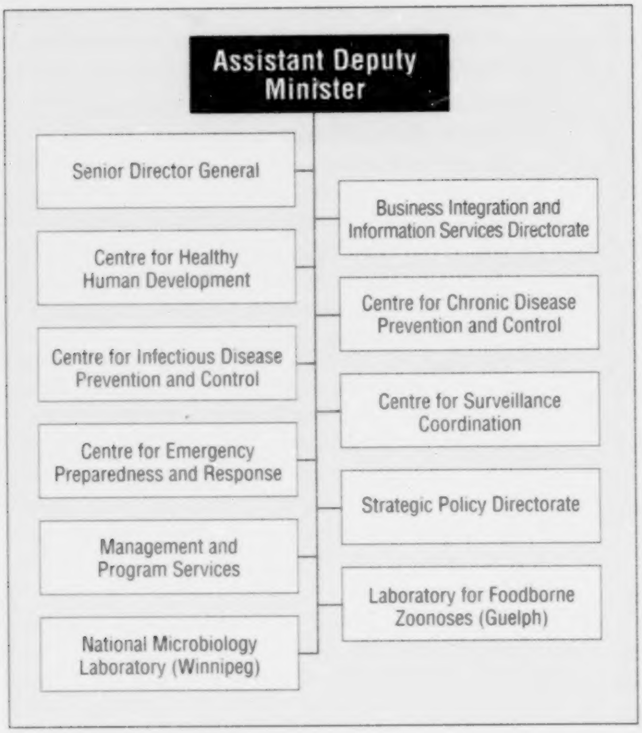
4.8 **The Government of Canada should fund a new Public Health Partnerships Program under the auspices of the Canadian Agency for Public Health. The Agency would thereby provide program funding to provinces and territories to strengthen their public health programming in agreed areas and in support of the National Public Health Strategy. The funding for the Public Health Partnerships Program should rise over 2-3 years to $300 million/annum.**

4.9 **The Government of Canada should incorporate into the new Agency the current grants and contributions programs of the Population and Public Health Branch of Health Canada. These grants and contributions should be reviewed and their uses aligned with the National Public Health Strategy and made complementary to the Public Health Partnerships Program.**

4.10 **Through the Canadian Agency for Public Health, the Government of Canada should invest $100 million/annum within 12 to 18 months to realize the National Immunization Strategy whereby the federal government would purchase agreed-upon new vaccines to meet provincial and territorial needs and support a consolidated information system to track vaccinations and immunization coverage.**

Appendix 4.1

Population and Public Health Branch: Current Organization Chart


Assistant Deputy Minister
Senior Director General
Business Integration and Information Services Directorate
Centre for Healthy Human Development
Centre for Chronic Disease Prevention and Control
Centre for Infectious Disease Prevention and Control
Centre for Surveillance Coordination
Centre for Emergency Preparedness and Response
Strategic Policy Directorate
Management and Program Services
Laboratory for Foodborne Zoonoses (Guelph)
National Microbiology Laboratory (Winnipeg)

Chapter 5

BUILDING CAPACITY AND COORDINATION: National Infectious Disease Surveillance, Outbreak Management, and Emergency Response

Public Health is charged with protecting the health of a particular population. Among other activities, this requires surveillance functions, the capacity to lead the fight against specific disease outbreaks, and the ability to participate effectively in a multi-modal response to major health emergencies. Out of surveillance flows the ability to issue alerts about health threats to public health practitioners, clinicians, health care facilities, governments, and the general public. Effective surveillance, coupled to first-line outbreak management, can prevent the spread of an infectious disease and its escalation into a full-blown health emergency.

Because first-line outbreak response occurs at the local or regional level, the general renewal of public health infrastructure will pay dividends in better preparedness for 'the next SARS'. Our brief overview of SARS in Canada also has raised issues about the capacity and interplay of P/T and federal level responses to disease outbreaks, and the interface between outbreak management and broader emergency responses. Accordingly, this chapter draws together several threads.

First, we briefly introduce some of the elements of surveillance and outbreak management. Our overview of the basics of outbreak management is cross-walked directly to the SARS experience, providing a framework to revisit the chronology from Chapter 2.

Second, we review the 1999 and 2002 reports of the Auditor General on issues of infectious disease surveillance and outbreak management. These reports are prescient in the light of the events surrounding SARS.

Third, we turn to the broader issue of health emergencies. Here, there appears to be some progress in F/P/T collaboration, triggered in part by the terrorist attacks in the USA on and after September 11, 2001 and recognition of the global challenge of bioterrorism. We highlight the need to clarify, and where necessary improve, the interaction of health emergency activity, specifically public health emergencies such as disease outbreaks, and broader emergency preparedness and response.

Fourth and finally, we outline how new transfers by the Canadian Agency for Public Health could reinforce the nation's second line of defence against infectious outbreaks by strengthening provincial and territorial capacity for communicable disease surveillance, epidemic response, and related activities in nosocomial infection control. This program of transfers would also seek to link these P/T activities with relevant federal centres to create a seamless national network for detecting and managing emerging and existing infectious threats to public health. Some federal funding and concerted action to ensure national preparedness should begin as soon as possible given the forthcoming winter season of upper and lower respiratory diseases. In the medium-term, the network must be harmonized with the other elements of a national public health strategy, including the Public Health Partnerships Program and funding to realize the National Immunization Strategy outlined in the previous chapter.

5A. Surveillance and Outbreak Management: Essential Functions for Public Health

5A.1 Surveillance

Experts have written lengthy chapters on the nature of surveillance functions in an ideal public health system. This report is not the place to repeat those details, but a brief introduction to this oft-misunderstood field is needed.

Health Surveillance may be defined as the tracking and forecasting of any health event or health determinant through the continuous collection of high-quality data, the integration, analysis and interpretation of those data into surveillance products (for example reports, advisories, alerts, and warnings), and the dissemination of those surveillance products to those who need to know. Surveillance products are produced for a specific public health purpose or policy objective.

Surveillance should be purposeful, economical, and action-oriented. It should not only detect emerging health risks, but include systems that allow public health officials to monitor and evaluate progress in health protection and disease prevention. New health risks such as bioterrorism and zoonoses, re-emergence of some diseases (e.g., multi-resistant bacteria), and globalization have fundamentally altered the scope and response time expected of surveillance programs at every level.

Surveillance uses whatever data sources will provide the necessary information. Surveillance systems may share data with personal health services information systems, but the end-products are different. Most of the data currently available from health facilities are originally generated for administrative purposes. They can serve as raw material for health services management and research, as well as for disease and health surveillance if procedures for capturing and handling administrative data are appropriately adapted.

In general, surveillance data can originate from any of four classes of source:

- **Special purpose**, i.e., data collected specifically for a particular surveillance need. Special purpose data sources select the most relevant data and facilitate detection and response, but are costly to operate and may be difficult to maintain over the long term.
- **Surveys**. Usually collected for more general health surveillance purposes, survey data differ from other special purpose data sets in that they are usually cross-sectional or 'one-off' and may be useful for multiple surveillance functions, notwithstanding their lack of specificity.
- **Administrative**. As noted, data collected for administrative purposes often find a secondary purpose in disease surveillance, e.g., analysis of the diagnostic fields on hospital discharge abstracts looking for geographic clusters of a particular disease. Administrative data are generally lower quality, and may not always be available on a timely basis, but are convenient to acquire and inexpensive.
- **Clinical**. For many surveillance purposes, this is the ideal source. Indeed, new diseases and emerging clusters of known diseases are often first suspected by astute clinicians who observe unusual patterns of illness, and work with others to initiate more systematic surveillance. Optimum efficiency in clinical surveillance can only be achieved if the clinical data are accessible electronically. This is rarely the case at present. The Electronic Health Record has the potential to be a rich source of surveillance data in future. Moreover, as submissions to the Committee have pointed out, clinical data for surveillance need to be assembled from a range of providers and facilities, including family physicians and other primary care providers, emergency departments, pharmacists, and veterinarians.

We alluded in Chapter 2 to the Global Public Health Intelligence Network [GPHIN]. While the two functions overlap, it is worthwhile to clarify the difference between surveillance and intelligence. Surveillance involves collection and aggregation of data before they are interpreted. In the case of intelligence, the sources of information have already been analyzed and interpreted (usually informally). Thus, an emergency physician may notice an unusually large number of cases of bloody diarrhoea and inform the local medical officer of health [MOH], or an MOH may post a report of an outbreak of flu-like illness with rash on an electronic bulletin board, or the GPHIN may detect news reports on influenza in Asia. The importance of intelligence is that it can alert authorities to look for similar cases in their own jurisdiction.

Public health is still struggling to catch up to the potential for effective surveillance afforded by new technologies. The problems have been not only the cost of implementing these systems (see Appendix 5.1 for the costing of a surveillance system), but also the very slow progress in gaining consensus across jurisdictions (as will be outlined below) and across programs on the architecture and standards. Grappling with recent demands placed upon the design of systems by privacy legislation has also been a serious challenge—one which we address in Chapter 9. As the Council of Chief Medical Officers of Health noted in their submission to the Committee, progress has been too slow, and "stovepipe" systems persist everywhere.

5A.2 Outbreak Management and Investigation

Outbreaks or epidemics are the occurrence of a disease in excess of its expected frequency. Outbreak investigations are a type of fast-paced epidemiologic research, undertaken to determine the cause of the outbreak and what remedial actions are required. These investigations are typically retrospective, occur in real time often under intense public and political pressure, begin without hypotheses, are iterative, and are closely tied to the implementation of public health measures to contain the outbreak. Outbreak investigations also involve considerable challenges in communication, including essential risk communication to the public.

Foodborne epidemics are commonly multi-jurisdictional because of the wide distribution of foodstuffs from a single source. They often require national or international action. However, the investigation and management of infectious disease outbreaks is typically local and provincial, at least in the first instance. Other levels of government may assist, and the epidemic may even be managed by national or international bodies, but as a general rule, the first line of defence is local. The SARS situation is thus in many ways a unique national and international experience, a sign-post for actual and virtual globalization. Never has a worldwide outbreak emerged so quickly, been so widely covered by the global media, or sparked such interaction among different governments and international agencies. And never has a hitherto-unknown agent been investigated so quickly.

Again, readers can find textbooks devoted to these issues. In brief, outbreak management involves numerous steps, starting with **epidemic detection and alert**. Recognition of a new threat has different permutations and challenges, depending upon whether the agent is known or unknown, whether the known agent is a notifiable or non-notifiable disease, and the extent of knowledge about how to contain the agent most effectively and efficiently. The special challenge in SARS was that the agent was new, its mode of transmission was initially unclear (e.g., droplet or airborne), and aspects of its infectivity (e.g., ability to survive on inanimate objects or 'fomites' for many hours) only emerged during the course of the outbreak.

Detection demands the timely upward reporting of data through the public health hierarchy—local, regional, provincial, national, global—and the collation and analysis of case data at the lowest level where a cluster of cases can be recognized. As a leading industrialized nation, Canada should be operating an exemplary surveillance system for new and known infectious diseases. Currently, it does not.

On occasion, cases may be scattered widely so that an outbreak is not detectable at the local or even provincial level. For example, Health Canada occasionally aggregates data showing a cluster of disease and notifies a province or provinces about an unrecognized epidemic of a foodborne illness. Obviously the success of these systems is critically dependent on timely and accurate information flows across jurisdictions, along with data management and analytic capacity at the appropriate levels. A smoothly-functioning laboratory network is also essential to ensure that case characterization occurs in a timely fashion.

Once an epidemic is recognized in one country, this intelligence can forewarn public health officials in other countries. Health Canada publishes the Canada Communicable Diseases Report every two weeks; its distribution is primarily in electronic format. At the global level, there are several alert mechanisms. The GPHIN, developed by Health Canada's Centre for Emergency Preparedness and Response and now used by the World Health Organization [WHO], scans media reports from around the world on the Internet. This information is fed into the Global Outbreak Alert and Response Network [GOARN], which notifies countries about the activity and catalyzes investigations. ProMed is an Internet alert system with a wide subscription base among infectious disease and public health practitioners. Individual clinicians and public health officials post unusual occurrences of infectious disease on ProMed. It constitutes an informal and often useful back-up system to more official channels.

We saw in Chapter 2 that an early opportunity to detect SARS in China was missed by Health Canada and WHO when a GPHIN report in November was not fully translated. However, by February, with an apparent outbreak of avian flu in Hong Kong and an unusual respiratory outbreak in Guangdong, WHO put member countries on the alert. WHO and Health Canada alerts were picked up by the British Columbia Centre for Disease Control [BC CDC]; the BC CDC's dissemination of that information was probably responsible for the prompt isolation of the first SARS case in Vancouver. Alerts were also issued by local and provincial public health officials in Ontario, but uptake was apparently inconsistent. In any event, the spread of the outbreak at The Scarborough Hospital, Grace Division was difficult to prevent given that the index patient's son arrived in the emergency department with SARS and without a travel history.

As recognition of a new disease emerged in Vietnam and Hong Kong, WHO sent out further alerts specific to SARS on March 12, 2003. In Canada, WHO alerts triggered an immediate cascade of domestic alerts. While all this was done promptly, SARS had already been in Canada for almost three weeks and the outbreak was taking flight in Toronto. A more effective Canadian alert system—involving both the ability to reach all levels of the health care system and an uptake/response capacity in the system—is absolutely necessary for the future.

Rapid epidemiologic assessment is essential at the beginning of an outbreak or epidemic to define the scope of the problem and start mobilization of containment strategies. In Canada at the national level, the Pandemic Influenza Committee was already in place, and it was transmogrified into the basis for the daily F/P/T SARS conference call. These calls served a useful purpose according to many informants, but most participants on the calls were not directly involved in fighting the outbreak. Moreover, those on the front-lines were overwhelmed by constant demands to give and get information by teleconference. Again, we see that Canada lacked back-up capacity—the 'B-team' functions that the CDC mobilizes in an outbreak. If nothing else, one might have expected rapid assessment to yield a focus on the epidemic curve for SARS with its positive messages, rather than the cumulative case counts that contributed to a sense of crisis.

The next step is **epidemic investigation** to identify the etiology and the modes of transmission of an infectious agent, thereby guiding appropriate measures to prevent further transmission. An ongoing outbreak is generally a health emergency. Approaches to its investigation require different modes of operation, different command-and-control structures and unified leadership. Investigators should be insulated from the constant demands of data flow. This did not happen with SARS in Canada. As one participant put it, "The continuous requests for information on a minute-by-minute basis, day and night—locally, provincially, and federally—hampered the efforts of a limited number of overworked staff to get on with the job of collecting, analyzing, interpreting and disseminating the epidemiologic information required to control this disease." Bureaucratically-structured organizations are not well suited to responding to an epidemic and their structures need to be modified for them to respond effectively to the exigencies of rapid 'command-and-control' responses. This was one of the major lessons learned from the CDC experience with anthrax. It underscores why a federal agency is necessary but not sufficient for improved responsiveness in Canada.

The collective activity in epidemic investigation during the SARS outbreak in Toronto was embarrassingly meagre. As we have seen, no shared database was established; jurisdictions squabbled over data flow; clinicians and public health physicians were unable to collaborate effectively on investigation and research; Health Canada's responses were well-intentioned but the federal government's role was unclear and its capacity limited as compared to the US CDC; the provincial public health laboratory was overwhelmed; and the provincial public health branch was not able to coordinate a response to an outbreak that involved four distinct local health units or take a leadership role in epidemic investigation. For data management Health Canada's web-enabled Public Health Information System [i-PHIS] was eventually put into service by the provincial public health branch, but not by local public health units as it does not yet contain contact tracing and quarantine management modules. Local agencies instead used systems built during the outbreak by each unit.

Establishing a case definition is central to disease surveillance and outbreak containment. The Committee has been advised that WHO developed its case definition to emphasize epidemiologic links because SARS, clinically, resembled so many other forms of atypical community-acquired pneumonia. As clinical and epidemiologic characterization of SARS continued and laboratory serology became available, case definitions did evolve both at WHO and elsewhere. In Canada, there were several changes throughout the epidemic in the case definition achieved by consensus on F/P/T conference calls, but again, this was not a straightforward exercise (see Appendix 5.2).

The first case definition from Health Canada demanded close contact with a suspect or probable SARS case for an epidemiologic link to be established. On March 31, 2003, the definition was revised to include "recent travel to a defined setting that is associated with a cluster of SARS cases." This was added to capture exposure to sites within Canada, particularly in Toronto where transmission of SARS had occurred in health care settings. The term 'travel', however, may have added to uncertainty about whether the definition was meant to apply to residents of SARS-affected areas. Ontario, moreover, had its own case definition (included in Appendix 5.2) that specified the need for an epidemiologic link consisting of "close contact" with a probable or suspect case. Other revisions to the Ontario definition were made on April 29, but the requirement for "close contact" was not changed.

On May 26, 2003, Ontario amended its definition after the emergence of the second wave of SARS to include "recent travel or visit within 10 days of onset of symptoms to a defined setting that is associated with a cluster of SARS AND no other known cause of current illness." As part of a general revision on May 29, 2003, Health Canada also amended its definition to make it clear that even a visit to a hospital with a SARS unit or other "identified setting in Canada where exposure to SARS may have occurred" should be considered sufficient link (again see Appendix 5.2 for details).

This inter-jurisdictional confusion, including Health Canada's belated recognition of the differences in definitions, and Ontario's decision to post its own more specific definition, may have contributed to non-recognition of clusters of potential SARS in Ontario, as public health assessors focused on demonstrating epidemiologic links. That said, clinicians would use their own best judgement regardless of any case definition, and the Ontario definition has also been defended as a necessity to contain the number of persons who would have to be investigated.

On March 17, 2003, Health Canada, mirroring WHO, added an exclusion criterion. SARS was excluded if another etiology was defined for a case that otherwise met the case definition. This tended to preclude the possibility that an individual might be infected with more than one agent, or that other non-infectious conditions (e.g., congestive heart failure or post-operative atelectasis) might co-exist with SARS (as was likely true on 4 West in North York General Hospital). On May 29, after the North York cluster, the definition was revised to specify that the alternative cause must "fully explain" the clinical presentation.

The other key change on May 29, 2003 was that the probable case definition now included a "suspect case with radiographic evidence of infiltrates consistent with pneumonia or respiratory distress syndrome on chest x-ray." This clarification was welcomed by Toronto clinicians, who had been frustrated with the insufficient weight given to radiological evidence.

The continued variation in case definition had international implications. Differences in case definitions around the world led to occasional misclassification of individuals who had visited Toronto, and later developed what was clearly not SARS, as exported probable or suspect cases of SARS. And in something of a *reductio ad absurdum*, US authorities took transit through the Toronto Airport (in Peel Region) as constituting a visit to Toronto for purposes of assessing exposure to a SARS-affected area.

Establishing an etiology is usually straightforward for known agents, provided the requisite logistical arrangements and laboratory capacity are in place. Scientists in Vancouver and Winnipeg were among the leaders internationally in sequencing the SARS coronavirus, which in turn facilitated the development of serological tests for SARS. Remarkable work was also done by laboratory workers in various institutions in Toronto to establish diagnostic capacity for the coronavirus, supporting clinicians on the front-lines and facilitating public health containment efforts. Unfortunately, as hospital laboratories stepped forward to take on responsibility for testing for the SARS coronavirus, the ability to monitor data at the national and even provincial level was undercut because of poor information systems and the lack of data-sharing protocols. Epidemiologic and laboratory data became even more disintegrated, compromising epidemic investigation efforts.

Confirmation of cases presupposes the existence of a definitive test to ascertain true cases. When the agent is unknown, as was true for SARS, this takes some time. More definitive testing was possible only towards the end of SARS I, with acquisition of the capability to detect the genetic fingerprint of the coronavirus from nasopharyngeal swabs, sputa, or stool, and during SARS II when serological tests for SARS became available.

Along with confirming apparent cases, the outbreak management and investigation team must **find cases and define the scope of the problem**. SARS was a huge challenge in this regard, because of the lack of any screening test, the similarity of the symptoms to other infections, and the lack of rapid confirmatory tests. Enhanced surveillance for the illness is particularly critical at precisely that point when it appears that progress towards containing the outbreak has been made. We have seen already that Canada's local responses were deficient in these respects. Part of the detection imperative also involved measures to find potential imported and exported cases of SARS. Health Canada was pushed internationally and nationally to implement expensive and cumbersome airline passenger screening procedures. We return to this issue in Chapter 11.

As data accumulate during the outbreak, the investigative team should be immediately **generating descriptive epidemiologic information**, as well as **generating and testing hypotheses**. For example, this step could have helped to pin down more rapidly the incubation period of SARS and attack rates in different subgroups. An investigative team normally uses case-control, cohort, and experimental studies to test hypotheses about the causative agent, its modes of transmission and possible interventions to contain it. Because of poor coordination, lack of standardized data collection, and substandard data management and analysis capacity, we are only reaching this stage now that the Canadian outbreak has receded. Many valuable opportunities were lost, and Canada's research productivity suffered as suggested in Chapter 2.

Reporting of findings of epidemiologic investigations to national and international bodies is a critical part of an outbreak investigation for several reasons. Understanding a disease allows other jurisdictions to put in place appropriate measures for its control and to learn from the experience of others. SARS has driven home the need for timely and accurate reporting of information on epidemics and their investigation to the national level, with subsequent reporting to other countries and international bodies. At times during the SARS outbreak, it seemed that reports through the public health system lagged significantly behind media reports, a situation that did not engender international confidence.

Outbreaks are often highly visible and are conducted under intense public, political and media scrutiny. **Communications with the media, clinical personnel, governments, and the public** are all extremely important. We return to intra- and inter-organizational communication in Chapter 8. Media demands on local and provincial public health officials were intense and time-consuming during the SARS outbreak. Management of communications was widely seen to be substandard, as indicated already in Chapter 2. Federal communications were generally reactive as Health Canada waited for the latest press conference in Ontario, and provincial communications in turn were frequently disorganized. Our perception is that as the outbreak continued, various media outlets themselves took on the role of public educators and modulators of risk communication in a commendable effort to stabilize community perceptions of the crisis.

The control of an epidemic through public health measures is the immediate purpose for epidemic investigations. With disease spreading, decisions on public health interventions need to be taken quickly and often with incomplete information. The actions that are taken in controlling any epidemic have very significant costs and may be controversial or highly unpopular. In the SARS epidemic, case detection, isolation of cases, follow up and quarantine of contacts, strict infection control measures in hospitals, closure of hospitals, airline passenger screening and travel advisories were the main tools used to control the epidemic nationally and globally. Along with massive impacts on tourism and travel, the outbreak had staggering costs. SARS led to direct costs through public health and health care measures necessary to contain the outbreak and treat those affected. Indirect costs were incurred as a result of: lost productivity from illness, quarantine, self-isolation, and related workflow disruption; payments to health care facilities and physicians in lieu of ordinary throughput-related revenues that were interrupted by SARS; salary and other compensation for those who were quarantined or otherwise unable to carry on their normal duties of employment as a result of SARS; and service backlogs in health care and public health that must now be cleared. The TD Bank has estimated the net cost of the outbreak to the national economy at between $1.5 billion and $2.1 billion.

The foregoing analysis may add to the impression from Chapter 2 that SARS in Canada was not an exemplar of outbreak management. However, so far as the Committee can tell, all those directly involved made their very best efforts. Countless health care and local public health personnel conducted themselves in exemplary fashion. To them goes the credit for containing an unprecedented and sudden outbreak of a hitherto-unknown and moderately communicable disease, with a meaningful fatality rate. Various other positive actions and developments are worth noting.

In British Columbia, alerts issued by the BC CDC set the stage for the early recognition and isolation of the province's first SARS case at Vancouver General Hospital. Public health surveillance measures were instituted, and an Emergency Operations Centre was opened. There were regular teleconferences among BC CDC experts, local medical health officers and the Provincial Health Officer, and active liaison with the infectious disease community. All physicians received direct communication about case definitions and protective measures, and a website was established. Additional cases of SARS in British Columbia were managed effectively, as were suspect cases of SARS in other provinces.

In Ontario, despite tensions between provincial and federal public health officials, data did flow and international reporting proceeded on a regular basis. Experts from local public health units and Health Canada collaborated in cluster investigation. The federal government assisted directly with the recruitment of various public health professionals such as epidemiologists, community medicine physicians, case investigators (i.e., public health nurses/inspectors) and public health managers. Ultimately, an effort by all three levels of government with support from stakeholders such as the Canadian Public Health Association allowed Toronto's personnel needs to be met. Health Canada staff also worked with P/T representatives to create working groups on surveillance, infection control, clinical management, laboratory issues and public health management.

The control efforts in Toronto involved multiple jurisdictions, and were carried out in a blaze of publicity. All leaders of the outbreak containment efforts worked day and night. Local public health agencies overcame systems deficiencies and effectively managed an overwhelming workload. Volunteerism was the order of the day, as exemplified by the contribution of the Scientific Advisory Committee and various clinical experts who worked at the Provincial Operations Centre and SARS Operations Centre in Toronto. Ontario was forced to activate its new emergency plans for the first time in the face of a mysterious and dangerous virus. Anxieties at times ran high, but citizens in affected areas were calm and generally tolerant of the disruption to their lives. Compliance with quarantine and other public health measures was extremely high. The Ministry of Health and hospitals alike learned from the first wave of the outbreak, and used a more selective approach to clinical care of SARS patients in the second wave. Stakeholder organizations such as the Ontario Hospital Association and the Ontario Medical Association made strenuous efforts to communicate with their members about SARS and to support the outbreak response. The outbreak affected students and trainees in many disciplines who receive training within hospitals; it also occurred at the time of final examinations for post-secondary institutions and Royal College examinations for resident physicians completing their specialty training. Nevertheless, all the involved educational institutions were able to manage in ways that enabled—or will allow—students to complete their programs or examinations on schedule. Hospitals showed unprecedented adaptability, and the bravery of a range of health care workers, including front-line nurses, physicians, rehabilitation professionals, respiratory and laboratory technicians, and ambulance personnel/paramedics, was little short of heroic.

These, moreover, are just a few of the success stories of SARS in Canada. They reflect people and institutions rising to the occasion in the face of suboptimal systems and inadequate preparation. To paraphrase T.S. Eliot, we can never build systems so perfect that people no longer need to be good. But the greatest lesson of SARS in Canada is arguably that there is no excuse for tolerating systems so imperfect that bad things happen unnecessarily to good people.

5B. The Auditor General's Perspective

Well before SARS appeared in Canada, the Auditor General highlighted the challenges faced by the nation in operationalizing an infectious disease surveillance system through existing F/P/T processes. The Auditor General's reports in September 1999 and September 2002 were highly critical of the failure of the F/P/T process to establish the needed infrastructure and concluded that these failings were impairing Canada's ability to detect and respond to such outbreaks. Drawing on the report prepared for the Committee by our legal consultant, Prof. Sujit Choudhry, the Auditor General's findings are summarized below.

Health Canada depends on the voluntary cooperation of provincial and territorial authorities, both regarding health surveillance (including case reporting) and responses to outbreaks. The large body of federal, provincial and territorial legislation that governs public health does not spell out the terms of inter-jurisdictional cooperation. Non-legal documents such as policy statements, intergovernmental agreements and memoranda of understanding are used inconsistently to formalize the terms of intergovernmental collaboration. Although there are disease specific arrangements (e.g., AIDS), there is no comprehensive F/P/T document that assigns specific roles and responsibilities to federal, provincial and territorial government actors. The lack of formal terms of cooperation impedes rapid responses to emergency situations. Formal documents are clearly necessary to deal with issues such as data sharing, data ownership, privacy, permitted distribution of data, and the consequences of governmental non-compliance with these terms.

Although the situation for AIDS, influenza and enteric diseases improved between 1999 and 2002, the Auditor General found that the general picture as of September 2002 remained worrisome with respect to the timeliness, accuracy and completeness of data. Provinces continued to vary in their reporting to Health Canada. For example, only 8 provinces (representing 55% of the population) reported cases of chicken pox. By 2002, an informal national agreement existed on the list of reportable diseases and most recent provincial lists of reportable diseases do show substantial and reassuring congruence. However, the flow of data to Ottawa remains inconsistent. Some provinces report diseases electronically; others do not. Provinces themselves are coping with under-reporting or non-reporting of new cases by providers. For example, a study of FluWatch in 1997-98 revealed that even with a rota of interested physicians, only 60% submitted a report each week. In addition, data on hospitalizations and deaths from flu were neither timely nor accurate—a situation that has not changed and has adverse implications for SARS surveillance.

An F/P/T process has been at work for several years to develop an integrated national public health surveillance network, through the Network for Health Surveillance in Canada. These committees include the Health Surveillance Working Group, the Communicable Disease Surveillance Sub-Group, the Canadian Public Health Laboratory Network, the National Health Surveillance Infostructure Project, and the Canadian Integrated Public Health Surveillance Project [CIPHS]. Health Canada's Centre for Surveillance Coordination was set up in 2000 to provide leadership on intergovernmental coordination. The Auditor General reported in September 2002 that some progress had been made. The Health Surveillance Working Group had agreed that a health surveillance infostructure should be developed. However, no specific timelines had been set, and the Auditor-General's office was told that a national system would "take several to many years" to develop, particularly in the absence of targeted funding.

More recently, welcome agreement has been secured on data elements for the core data set of communicable diseases, and progress is being made on disease-specific data sets. The federal government has developed both the Laboratory Data Management System and, as noted above, i-PHIS, both components of the Canadian Integrated Public Health Surveillance program. These platforms have been adopted by many provinces, most recently Ontario post-SARS. On the positive side, the federal government will continue to cover the cost of software development and provinces are able to add specific modules as they see fit. However, we have seen that i-PHIS lacked the capacity to manage an outbreak, and has not been adopted by the local public health units where the front-line work of SARS containment was done. The Laboratory Data Management System has not won consistently favourable reviews even inside the Health Canada laboratory system. Although CIPHS will allow for real-time reporting at the national level, these data will not be comprehensive in scope, because some provinces are still not participating. Health Canada's aim is to pass the infostructure development project to a federal/provincial/territorial consortium (the CIPHS Collaborative). However, some informants suggested to the Committee that a large-scale and customized architecture was undesirable, and that the way forward should be more incremental, relying on flexible and widely-available commercial software as the primary platform. Thus, both technical and jurisdictional issues are still in play, and exacerbated by resource constraints.

The Canadian Enteric Outbreak Surveillance Centre (CEOSC) now provides an electronic vehicle for public health practitioners and users, thereby allowing a growing number of officials to exchange and discuss information about enteric outbreaks in a secure environment. Health Canada's Health Products and Food Branch has revised its Food Illness Outbreak Response Protocol. The Branch intends to consult with provincial and territorial government authorities in the Fall and will seek endorsement of the Protocol by F/P/T Deputy Ministers of Health in December 2003. In sum, progress continues, but it is slow and fragmentary.

5C. Managing Public Health Emergencies

5C.1 Public Health qua *Firefighting*

SARS can be considered as a relevant and revealing test of the resilience and the flexibility of the public health infrastructure to manage health emergencies of any kind. Emergency management experts advise that the successful resolution of an emergency, whether in health or otherwise, always requires preparedness, planning, efficient and well-coordinated responses, and quick and accurate decision making by the responders.

A common metaphor for this successful emergency continuum is firefighting. Detection of the blaze is akin to the action of an astute nurse, pharmacist, or physician who detects an unusual illness or disease cluster and immediately alerts the relevant administrators or local public health department. The response of firefighters is analogous to the response by front-line public health workers at the local level. The analogy extends to decision making about the need for support. With any large blaze, an incident commander arrives on the scene and must assess whether the fire is beyond the capacity of his or her crew. If so, back-up equipment and personnel are called. Effective public health emergency response similarly requires the presence of an authority on the scene who is charged with direct command-and-control responsibility. We expect that firefighters and fire engines from different jurisdictions will come together seamlessly to contain an emergency. In the public health field, this seamlessness can only come about from effective preparedness and coordination by public health authorities at the local, provincial, federal and territorial levels. As with firefighting, there must be knowledge of common operating procedures, compatible training and equipment and, most importantly, prior agreements for mutual assistance in emergencies requiring a sudden surge capacity.

The public health analogy can also be extended back to prevention of fires. For example, municipal governments implement building codes to require flame retardant construction materials. Firefighters spend considerable time in fire safety education aimed at preventing fires and preparing citizens to do first-line firefighting at home, in institutions, or in workplaces. Analogous activities are food safety and public health inspection, immunizations, and various health promotion activities. When prevention breaks down or is inadequate, firefighters move to emergency response mode, as do public health workers.

In the preceding sections, we saw that F/P/T collaboration has been inadequate in the realm of disease surveillance and outbreak management. Had the SARS outbreak mushroomed into a truly national epidemic, our lack of preparedness could have been disastrous. The SARS outbreak and subsequent events in Toronto therefore illustrate the need to address public health emergency response gaps and to develop a more comprehensive approach to managing public health emergencies through a truly pan-Canadian system.

This integrated pan-Canadian system should encompass all the tools, plans and agreements necessary to respond to SARS or to any other large scale public health emergency. If, as we have seen, governments cannot agree on surveillance strategies during 'business as usual', then one can hardly expect them to work cohesively in the heat of an outbreak.

5C.2 The National Emergency Framework

The federal government's generic emergency framework assesses incidents on a spectrum progressing from small to large and from the slightly consequential to the catastrophic. Emergencies, including disease outbreaks, progress along a jurisdictional spectrum from the local response, up to provincial, national, continental and ultimately international levels.

The federal policy for emergencies accordingly assumes a hierarchy of response moving through successive levels of government in a mutually supportive chain. All federal government departments are required under the *Emergencies Act* and the *Emergency Preparedness Act* to have their own departmental emergency plans. The latter legislation, proclaimed in 1988, puts a particularly clear onus on federal ministers to be prepared for civil emergencies, and "to monitor any potential, imminent or actual civil emergency and to report, as required, to other ministers on the emergency and any measures necessary for dealing with it." Similar requirements exist at the provincial level, where multiple P/T jurisdictions have been reviewing and upgrading their emergency planning and preparedness frameworks. Plans and preparations undertaken by the federal government departments focus on actions to assist provinces when their capacity to respond is exceeded, to save lives and to preserve peace, order and good government. Federal departments are also expected to prepare for transborder or international emergencies with appropriate policy, risk analysis and communication strategies.

All federal departments involved in an emergency follow four key response principles: an all-hazards approach; decentralization to departments that assume command and control; interdepartmental coordination; and federal/provincial coordination. The first three are straightforward. The all-hazards approach recognizes that while the causes of emergencies and disasters are diverse, the response capabilities to deal with them are frequently similar. In the federal government structure, emergency planning and response is decentralized to take advantage of relevant knowledge and expertise as well as command-and-control capacity, resources, and regulatory tools residing within different departments. While some emergencies may be dealt with by a single federal department or agency, most incidents warranting a federal response require the involvement of a number of departments. In all cases, one department takes the lead role that assumes command and control while others play supporting roles.

It is at the level of F/P/T collaboration and coordination that the gaps emerge. All provincial and territorial governments have constitutional responsibility for the safety, security and well-being of their citizens. The provinces and territories have all created frameworks to meet their constitutional responsibilities, and as noted, modernized these apace in many instances. However, to the best of the Committee's knowledge, the federal, provincial and territorial frameworks have not been analyzed for comparability and interoperability. Federal and provincial emergency planning must be as integrated as possible to avoid confusion and duplication of effort and to ensure a timely flow of essential information and advice between levels of government. In other words, what happened with SARS could happen with a natural disaster.

5C.3 Focal Points for Health Emergencies

The federal government created the Centre for Emergency Preparedness and Response [CEPR] in July 2000 to act as a national coordinating point for public health security within Health Canada and across various levels of government in the country. This addressed the need for a more consistent, sustainable and integrated approach to preparing for and responding to all types of public health emergencies in Canada. The Centre brought together most of Health Canada's emergency preparedness and response programs and created a 'critical mass' of resources to allow for a more cohesive and synergistic response to emergency situations from both a departmental and interdepartmental perspective.

The CEPR mandate focuses on public health issues arising from various threats to the safety and health security of Canadians, including:

- natural events and disasters such as floods, earthquakes, fires and highly dangerous infectious diseases; and
- human-caused disasters such as accidents or criminal and terrorist acts involving explosives, chemicals, radioactive substances or biological threats.

CEPR, in collaboration with provincial and territorial governments, operates the National Emergency Stockpile System [NESS]. This system, little known to Canadians, maintains $300 million in medical services, supplies and equipment in a state of readiness for immediate distribution to provinces and territories in the event of a human-caused or natural disaster. NESS contains supplies found in medical treatment centres ranging in size from small field medical units right up to a large hospital, including beds and blankets, and pharmaceuticals. The stockpile includes 165 emergency 200-bed hospitals that are transportable on short notice either by truck or airplane. They are stockpiled throughout the country and can be set up in existing buildings such as schools and community centres. The Committee recognizes the utility of NESS and recommends that the stocks and the operating principles be updated to allow for interoperability with current health care facilities. As the situation with N95 masks showed during the SARS outbreak, a sourcing and clearinghouse function on the part of NESS may be more important than the creation of static stockpiles. We also see the need for F/P/T training and exercises to ensure that personnel are familiar with the equipment in this largely unrecognized national resource.

CEPR has integrated functions that would be carried out in most provincial settings by the Chief Medical Officer of Health, Emergency Health Director, and Emergency Social Services Director. Not all provinces have created parallel structures that provide a single focal point for health emergencies. In Ontario, the Commissioner of Public Security and Commissioner of Public Health shared the lead role in the SARS outbreak, contributing to a lack of clarity about authority. In Quebec, an all-hazards approach to emergency preparedness and response is led from a planning hub within the Ministère de la Sécurité Publique. This hub assigns an emergency response coordinator to other departments who become part of a network for integrated information sharing and response. The Quebec model is attractive, but could also lead to some of the same challenges as emerged in Ontario.

The Committee recognizes that health emergencies such as major infectious disease outbreaks rapidly become general emergencies, with a panoply of concerns that spill across multiple government departments. The choice of a lead official from the health department or from public security will depend on the specific nature of the threat to population health. What is needed, in any event, is a clear protocol for determining a lead official, appropriate expertise around that individual, and the delegation of appropriate command-and-control authority to the leader of the response to a public health emergency. The federal CEPR has the advantage of creating a major focus for health emergencies that can either take the lead itself, or connect smoothly to broader emergency response machinery. It was not fully tested by SARS and the strengths and weaknesses of the model may only become apparent in a larger-scale crisis. The Ontario SARS experience, in contrast, constituted a particularly difficult first test for that province's new emergency machinery. Comparing notes across F/P/T jurisdictions seems prudent to determine whether current legislative, regulatory, and administrative elements are optimally organized either to exert the required command-and-control functions in a public health emergency, or to allow smooth interactions between health departments and a command-and-control function vested in another branch of government, such as an office or department of public security.

5C.4 The Post-September 11 Environment

In the immediate aftermath of September 11, 2001 terrorist attacks on the World Trade Center and the anthrax bioterrorist attacks in the United States, the federal, provincial and territorial Ministers of Health met to plan a common response and to map out a strategy for strengthening the public health sector's emergency prevention, detection and response capacities. The public health system was recognized as the key mechanism whereby such threats can be prevented or contained. Our American neighbour's tragedy sparked an important degree of solidarity at the F/P/T tables that we hope will carry over, post-SARS, to the broader goal of enhancing public health in Canada.

In October 2001, the F/P/T Deputy Ministers of Health created the Special Task Force on Emergency Preparedness and Response with broad representation. In March 2002, the Special Task Force tabled 31 recommendations grouped under broad clusters such as: leadership and coordination; surge capacity; training and education; surveillance and detection infrastructure (including laboratories); supplies; and communications. The F/P/T Deputy Ministers and Ministers of Health endorsed the recommendations of the Special Task Force, and created the F/P/T Network for Emergency Preparedness and Response to develop strategies and a plan to implement the recommendations. The Special Task Force went to great lengths to promote the benefits of enhanced F/P/T coordination across virtually every area of concern.

Notably, the Task Force emphasized the importance of building on existing public health infrastructures to achieve effective emergency response coordination across Canada. This idea of "filling in the gaps" rather than starting from scratch recognizes that our public health infrastructure remains the best basis from which to prevent, detect, respond to and manage disease outbreaks—including terrorist actions based on chemical, biological and radionuclear weapons of mass destruction.

Since March 2002, the various partners in the F/P/T Network for Emergency Preparedness and Response have been working to integrate public health practices into a truly national emergency management system. The national emergency management system aims to support strategic investments in public health security; enhance cross-sectoral and cross-jurisdictional collaboration; increase information sharing; establish clear emergency management protocols, roles and responsibilities; and establish greater coordination between emergency health and social services and public health practitioners.

The Network has already supported the federal CEPR's efforts to develop a National Emergency Transportation Strategy that will ensure the transportation of samples, personnel, materials, supplies and medical countermeasures in emergencies whatever they may be. The Emergency Preparedness and Response Framework is also being applied to public health emergencies. The Network has been involved in the development of a series of integrated national emergency response plans including the *National Smallpox Contingency Plan* and the *Pandemic Influenza Plan*. For example, work on the National Smallpox Contingency Plan involved provincial and territorial consultations that brought together over 200 individuals from a variety of professional streams including public health officials, laboratory scientists, epidemiologists, emergency health services, emergency social services, and ambulatory services. And as we have seen, work on Pandemic Influenza Planning formed the platform for some successful F/P/T interactions during the SARS outbreak.

More generally, CEPR has been working with provinces, territories, and other federal departments to update and expand Emergency Preparedness Training with a view to incorporating public health needs, but these activities are still under-resourced and underdeveloped. Effective emergency response also requires timely communication and passage of information among all response partners. The SARS outbreak clearly illustrated that many of the necessary data-sharing arrangements and business process agreements have yet to be developed. The emergency paradigm presumes that there will be sustained efforts to develop, test and maintain interoperability amongst federal, provincial and territorial emergency operations centres. This includes conjoint training exercises. As a corollary, the Committee sees an urgent requirement for multi-jurisdictional planning to create integrative protocols for outbreak management, followed by training exercises to test the protocols and assure a high degree of preparedness to manage outbreaks.

In sum, at the time of the World Trade Center and anthrax attacks, emergency leaders in health services, social services, public security, and public health worked independently from one another in most Canadian jurisdictions. Progress has since been made in collaboration across and within jurisdictions. Canadian governments at all levels need to capitalize on this momentum, and invest urgently in formal mechanisms to exchange information, share best practices, undertake conjoint training, integrate and test contingency plans, and examine the interoperability of processes, protocols and equipment to respond to health emergencies.

The Committee also wishes to emphasize the need for involvement of non-governmental organizations [NGOs] and employers in the process of emergency preparedness. In this respect, long before the 9/11 attacks, six Canadian NGOs had agreed to share resources in an emergency and settle up the financial implications later—an example that governments could emulate. Major employers have their own role to play. For example, during the SARS outbreak, a major information technology company in

Toronto took prompt action, activating an eight-point contingency plan to shut down operations after an employee left quarantine and arrived at work with SARS-like symptoms. However, little is known about the state of corporate emergency plans more generally and the degree of interaction between major employers and public health units or emergency measures/public security offices. Communication with major employers, and especially with enterprises involved with high volumes of human traffic such as hotels, airports, and transportation providers (e.g., VIA Rail) was suboptimal during the SARS outbreak. These links must be strengthened as part of emergency preparedness.

5C.5 Building Surge Capacity

The outbreak of SARS has reinforced the need for surge capacity to provide greater flexibility in health and public health emergency response. Developing robust surge capacity across jurisdictions is predicated on adequate professional resources, a depth of skill sets and overcoming jurisdictional legislative and regulatory barriers to allow, for instance, medical practitioners and health professionals to act outside their licensing jurisdiction in emergencies. A number of stakeholder briefs addressed this topic, including a joint communication from nine national health-related associations.

At the outset, the Committee endorses the Canadian Public Health Association's caveat: the concept of surge capacity must be based on a sufficiency of capacity for 'business as usual', thereby allowing effective redirection of resources in time of need. The Canadian Federation of Nurses Unions and other stakeholders similarly emphasized that surge capacity is difficult to create when there are shortfalls in resources for usual public health and personal health service needs.

To create surge capacity for emergencies, the above-noted F/P/T Task Force on Emergency Preparedness and Response endorsed the concept of establishing a national framework to mobilize teams of professionally-qualified first responders to crisis sites as requested by a provincial/territorial or international authority. The Canadian concept is modelled after the United States' National Disaster Medical System. The US system has included the organization of over 7,000 volunteer clinical personnel into trained response teams for quick disaster response. For example, the US federal government was able to place four to five teams at the periphery of the World Trade Towers collapse within hours of the event. The Canadian concept builds on and expands the US approach.

CEPR established the National Office of Health Emergency Response Teams in December 2001. Subsequently, F/P/T Deputy Ministers and Ministers of Health have unanimously endorsed the principles for the development of Health Emergency Response Teams [HERT]. The National Office has a broad mandate to oversee funding, recruitment, planning, equipment, training and education, field exercises, operational deployment, transportation and coordination of the teams.

A HERT would be composed of professional health personnel specially trained and certified for rapid deployment to disaster sites across the country. Each HERT would follow a generic "all hazards" approach encompassing emergency medical response to natural events such as earthquakes, tornadoes and to man-made disasters including chemical hazardous material spills and chemical, biological, radiological or nuclear terrorist attacks and, in the aftermath of SARS, infectious disease outbreaks. These teams would be positioned in strategic locations across the country, and available to assist and support local/provincial/territorial health authorities in the management of emergencies.

While the HERT model has been developed as a multi-disciplinary group of clinical and support personnel for "all hazards", the SARS experience has highlighted the need to be able to mobilize select groups of skilled personnel such as quarantine officers and public health nurses. The related concept of 'epidemic response teams' has been endorsed by various stakeholder submissions. Nonetheless, the HERT program has the potential to be a platform for the mobilization of personnel to address the specific requirements of a health emergency, such as an epidemic or major outbreak of infectious disease. The concept is already complemented by specialized surge capacity-building that is underway through the F/P/T Network for Emergency Preparedness and Response, viz. development and deployment of a Smallpox Emergency Response Force and Pandemic Influenza Response Teams.

The federal government would activate HERTs at the request of the province or territory, or alternatively, in response to an event falling within the jurisdiction of federal responsibilities. A HERT deployed at Kananaskis in the support of the G8 Summit is an example of the latter function.

Sponsorship of a HERT can range from local organizations such as a hospital or local health department to provinces and territories. Coverage for professional and legal liabilities must still be determined as part of the HERT development process, but this problem is surmountable with appropriate funding. The Committee is aware of a similar provincial proposal developed by some clinical leaders in Toronto and Hamilton after SARS, and we expect that parallel structures may emerge in multiple jurisdictions. Again, however, the goal must be to coordinate activities seamlessly, rather than set up overlapping and competing teams. For example, in the current national framework, if a HERT is deployed for emergencies that do not cross provincial boundaries and do not require federal intervention, then upon request by the province or territory to the federal government, the team would be designated to assist the provincial response. The responsibility for all costs, equipment replacement, licensing, liability and all other factors directly and indirectly related to the use of the teams then becomes a provincial or territorial responsibility.

Based on the SARS precedent, expedited cross-jurisdictional licensure of healthcare personnel should be feasible to facilitate HERT activity. One option is that the licensing authority in the affected province should accept all qualified individuals for the purpose and duration of the emergency as long as those persons are appropriately licensed in at least one province/territory in Canada. The functioning of HERTs will require enthusiastic and committed partnerships at all levels of stakeholders from federal departments, provinces and territories, NGOs, regional and municipal agencies and health care organizations, healthcare facilities, and individual professionals.[1]

5C.6 Crisis Communications to the Public: A Missing Link

Communications to the public during an emergency are crucial, as we have seen. During the SARS outbreak, Health Canada determined at the outset to identify one consistent spokesperson in English and one in French. Liaison was established with the Ontario Government Communications Office and with CDC Communications in Atlanta. Among the other strategies were: creating and continually updating a SARS website, establishing a 24/7 1-800 public information line; briefing media; and issuing travel advisories, an activity to which we return in Chapter 11. Federal spokespeople understandably had a lower profile than provincial and local health leaders and clinical experts, and communications strategies, as with other elements of outbreak management, were not well-coordinated across jurisdictions.

Health Canada's in-house specialists have done their own assessment post-SARS and noted the need for a clearer framework for F/P/T collaboration. Prior to SARS, an F/P/T group had in fact worked together to develop a National Crisis Communications Strategy aimed at helping Canadian governments plan for, and respond to, the communications challenges inherent in a wide range of emergencies from natural disasters and disease outbreaks to terrorist actions. This work must move ahead promptly.

The Committee appreciates that communicating accurate data to the public during a fast-moving outbreak can be enormously difficult, and SARS was no exception. A particular challenge was the lag in characterizing cases. Epidemic curves posted on the Health Canada website were constructed by date of onset. This is a more consistent and valid approach than tallying new cases by the date that they came to attention. However, there is a Catch-22. If new cases are assigned back to an earlier date of onset, it can appear as if the outbreak is over prematurely. If new cases are instead reported to the media as part of a cumulative case count, the impression is created that the outbreak is still snowballing when the number of new cases might actually be falling. One way around this problem is the use of statistical projections to control for anticipated reporting delays. The other is to report the data from different analytical perspectives, an approach that could cause confusion but is more comprehensive and accurate.

These communications nuances were apparently addressed 'on the fly' during the outbreak. The Committee has ascertained that Health Canada does not have a sophisticated analytical framework for risk communication. Health Canada must build expert capacity in this area.

Similar shortcomings were evident elsewhere during the SARS outbreak. Focus groups with front-line staff (see Chapter 8) suggested that even within well-established and close-knit organizations that had crisis plans in place, risk communication was suboptimal during the SARS outbreak.

Peter M. Sandman was consulted by the CDC about its crisis communications strategies, an area of increased emphasis and investment for that organization in the wake of the anthrax attacks on the US. Sandman and Judy Lonard have published various documents[2] that offer a useful perspective on risk communication during SARS and more generally, including a set of counterintuitive but compelling axioms for crisis communication. For example, they suggest that downplaying the risk of an outbreak such as SARS is ultimately damaging; over-reassurance should be avoided. Spokespeople should not conceal their fears or downplay risks; "a fearless leader is a useless role model." Intriguingly, they urge communicators to be "at least as worried in public as you are in private." The paternalistic assumption that the public should be blandly reassured is wrong. Instead, lay risk assessments should be respected. (In the Committee's view, a corollary is that the risk assessments of front-line health care workers should also be respected.) The goal of communication should be to teach the public what useful steps they can take to help fight the outbreak, rather than offering reassurances that will ring false.

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[1] As regards partnerships, the Canadian Pharmacists Association has highlighted the need to consider role re-definition in the face of public health emergencies. They recommend that legislation be amended to allow pharmacists to administer vaccines in the case of pandemics or biological warfare/terrorism. This could bring thousands of additional front-line health professionals into play to support epidemic response.

[2] See http//www.psandman.com [Enter searchword SARS to locate several items].

Sandman and Lonard have been scathing in their assessment of Canadian communications strategies around SARS, particularly in comparison to the deft handling of communications in Singapore:

> *"The same day WHO lifted Canada's travel warning, the international health agency said that the worst of Singapore's SARS outbreak seemed to be over. Singapore health ministry spokeswoman Eunice Teo responded masterfully by moving to the fulcrum of the risk communication seesaw. 'The WHO said the peak is over in Singapore,' she noted, 'but our minister has said it is too early to tell.'"*

This type of balance, in their view, ultimately generates more sustainable public confidence "than Canada's angry protests and premature celebrations. Canada's foreign stakeholders (and in private, even its own citizens) are likely to sit on the worried, distrustful seat of the risk communication seesaw, since Canada is occupying the over-reassuring, over-confident seat."

Public opinion research commissioned by Health Canada suggests that Canadians were actually riding the "seesaw" alongside various spokespersons, not reacting to them. A poll was taken after the WHO travel advisory when political and health leaders united to highlight the progress being made in containing the outbreak. Among respondents nationally, 62% said the SARS situation was improving on April 29-30, 2003, up from just 33% during April 25-26, 2003. In Toronto, 68% said the situation had gotten better. Nonetheless, given the second wave of SARS in Toronto, Sandman and Lonard's comments about sitting on "the over-reassuring, over-confident seat" seem all too prophetic. The CDC now has a comprehensive crisis communications training program[3] that, in our view, bears close study and early emulation. Nothing we have seen from any F/P/T jurisdiction to date is comparable.

5D. National Capacity and Network for Disease Surveillance & Outbreak Management

Focusing on smallpox, SARS or pandemic influenza raises the risk of over-investing limited resources in managing a restricted range of public health emergencies rather than engineering a system that can be flexible and responsive as well as sustainable. This section focuses on how to build provincial and territorial capacity for responding to communicable diseases, and how to connect that capacity into a strong network of federal, regional, and provincial hubs for disease surveillance and outbreak management. The network, in turn, must be linked to the existing F/P/T Network for Emergency Preparedness and Response, thereby creating the multi-level protection that Canadians need and deserve.

By way of precedent, the European Commission formed a Network on Communicable Diseases in 1999. It builds on the capacity of member states and focuses on surveillance and early warning for outbreaks with greater than national dimensions. The Commission has specified that communicable diseases should be placed progressively under EU-wide surveillance. To monitor and track developments, disease-specific networks have been created. At present, these consist mainly of key laboratories in participating countries. Following on from discussion over a number of years about the creation of an infectious disease agency for Europe, the European Commission has also just adopted a proposal to create a European Centre for Disease Prevention and Control by 2005. The Centre will have a small core staff and coordinate an extended network in member states. Fifteen European countries sponsor the European Program for Intervention Epidemiology Training. It is similar to Canada's Field Epidemiology Training Program, but also represents a potential F/P/T collaborative model. In short, if the sovereign nations of Europe have come together around infectious disease surveillance and management, how can Canada allow F/P/T tensions to undermine its response to public health threats?

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[3] See http//www.cdc.gov/cdcynergy/emergency/

Chapter 4 outlined a $300 million per annum investment for core public health functions that would help to shore up Canada's first line of local responses to disease outbreaks and health threats, particularly when coupled with a $100 million per annum injection of support for new vaccines. The handling of the SARS outbreak in Ontario illustrates that a different level of functionality is also needed—a second line of defence at the provincial or regional level with surveillance, analytical, investigative and coordinating capacity. Quebec's National Institute of Public Health and British Columbia's Centre for Disease Control both offer models in this respect. We focus on the BC CDC because of its primary mandate in infectious diseases.

The BC CDC was established to be the province's focal point for "the prevention, detection and control of communicable disease," and a provider of specialty health support and resource services. The Centre integrates five divisions: Hepatitis Services; Epidemiology Services; Laboratory Services; STD/AIDS Control; and Tuberculosis Control. Support services include Information Management and Pharmacy. In April 2002, the BC CDC assimilated several new programs, including a Drug and Poison Information Centre; Food Protection Services; and Radiation Protection Services. The BC CDC works closely with the provincial health ministry, Medical Health Officers, and the Provincial Health Officer. Its annual budget of approximately $70 million includes $30 million for vaccinations and $40 million directed primarily to control of communicable diseases. The BC CDC has catalyzed the creation of the University of British Columbia (UBC) Centre for Disease Control in research and teaching activities. The UBC CDC focuses on "collaborative research into the surveillance, control and prevention of communicable disease" and "links academia, governments and public health organizations in the understanding, management and prevention of infectious diseases of public health significance." The BC CDC has proven sufficiently successful that its mandate is now broadening to include other specialized areas beyond its communicable disease mandate.

This type of investment and structure will not be attractive or appropriate for all provinces and territories individually. Some provinces could structure their participation in a national network as a within-province network, drawing on strengths in both public health and academe; smaller provinces in a region may decide to pool resources and create a regional CDC. Transfers from the new federal agency to catalyze this second-line capacity for surveillance and outbreak management must accordingly allow for reasonable P/T pluralism.

Estimating the required level of contributions through the new federal agency is not straightforward. As one simple benchmark, approximately $40 million per annum is invested by the BC CDC, outside of vaccines, to maintain an outstanding core infectious disease facility for that province. British Columbia has 13% of Canada's population, thus roughly $280 million per annum would be required to sustain similar activity across Canada. However, other P/T jurisdictions have already developed some capacity analogous to the BC CDC, not least Quebec through its multidisciplinary National Institute of Public Health.

As well, this second line of defence could be construed as exclusively a P/T responsibility. We reject that argument as an abdication of federal responsibility on four counts.

First, the Auditor General's comments underscore an acute need to build surveillance capacity across Canada as a matter of broad national interest. Multiple stakeholders urged the Committee to foster a national approach to infectious disease surveillance. The US precedent suggests that national data and surveillance systems are only achievable with dedicated federal funding. To that end, the investments in the new federal agency outlined in Chapter 4 already presumed that $25 million per annum towards surveillance would be drawn from a separate allocation for infectious diseases.

Second, as the SARS experience demonstrated, even substantially enhanced firepower in a new federal agency will do little in the absence of a well-coordinated response to an outbreak at the provincial level. SARS has also highlighted the importance of enhanced nosocomial infection control. Better linkages between public health and the clinical sphere, and the roll-up of institutional infection control activities to the P/T and ultimately national level, will not be achieved without meaningful funding.

Third, if any province fails to contain an outbreak efficiently, the results for all of Canada are devastating on multiple levels. We refer not just to the spread and toll of disease, but other impacts. The Greater Toronto Area, for example, accounts for approximately one-fifth of Canada's GDP, and SARS therefore had national economic implications.

Fourth, Ottawa's revenue-collecting and spending powers are disproportionate to its constitutional administrative mandate in the Canadian federation. This tension in the national fabric places a constant onus on the federal government to fund provincially-administered activities, particularly those that are in the broad national interest.

On the other hand, the provinces also have revenue-generation mechanisms and access to new funds from the Canada Health and Social Transfer. The Committee assumes that P/T jurisdictions would not claim their rightful authority in a strengthened public health system without taking responsibility for helping to fund it. Hence, just as the Public Health Partnerships Program would leverage P/T investments in local public health infrastructure, so also do we assume that federal transfers for prevention and control of communicable diseases at the P/T and regional level would be matched in some measure by the involved P/T jurisdictions.

Weighing these factors and estimates, the Committee envisages that the Canadian Agency for Public Health should ultimately receive and earmark $100 million per annum for support of P/T capacity in infectious disease surveillance and outbreak containment in the form of a Communicable Disease Control Fund. This is distinct from and above the transfers recommended for general public health infrastructure and immunizations, and completes the $500 million per annum suite of P/T contribution programs that the Committee views as necessary for the renewal of a national public health system. We anticipate that these transfers would start at a lower level and rise over a number of years in response to enhanced capacity arising from increases in the numbers of skilled personnel and interlocking P/T investments.

Initial allocations from this Communicable Disease Control Fund should start flowing in advance of the creation of any new agency as part of preparedness for the winter influenza season. Similarly, the creation of an F/P/T Network for Communicable Disease Control can begin sooner rather than later to ensure that F/P/T jurisdictional collaboration is enhanced, and that the nation is appropriately positioned to respond to existing and emerging infectious diseases. We explain further in Chapter 9 how these transfers should be tied to intergovernmental agreements and initiatives to secure standardized business processes and a harmonized legislative framework for disease surveillance and outbreak management. For now, we refer readers to Appendix 5.3 below for a summary of the agreements required to promote a more seamless approach to outbreak management and prevent a recurrence of the inter-jurisdictional tensions evident during the SARS crisis.

As suggested in Chapter 4, the Communicable Disease Control Fund directed at infectious disease surveillance and outbreak management could be bundled with the Public Health Partnerships Program and National Immunization Strategy into a single transfer managed according to the Social Union Framework Agreement. This ensures maximum flexibility for the Chief Public Health Officer of Canada and her/his provincial/territorial counterparts in aligning transfers with both provincial/territorial priorities and a national strategic plan.

Although accountability for the transfers from the Communicable Disease Control Fund would be determined between each P/T jurisdiction and the new federal agency, some proportion of the $100 million should be reserved for networking functions. The concept of a second line of defence presupposes strong connections not only among provincial and regional centres of excellence in infectious disease control, but also between these P/T nodes or hubs and the relevant centres in the new federal agency. The latter could include the National Microbiology Laboratory, the Centre for Infectious Disease Prevention and Control, the Centre for Surveillance Coordination, and the Centre for Emergency Preparedness and Response.

This F/P/T Network for Communicable Disease Control could be formed quickly by connecting structures that already exist in some provinces (e.g., the BC CDC, relevant centres in Quebec's National Institute of Public Health) to leaders from other provincial public health branches pending their decision on the creation of provincial centres of specialized expertise. Agreements among participating provinces and the relevant nodes and centres within the Canadian Agency for Public Health would be negotiated with the intent of maximizing co-location of facilities and personnel, and creating both integrated disease surveillance machinery and graduated responses to infectious disease outbreaks. The network would presumably include task forces or working groups to address issues such as surveillance, outbreak management and emergency response, nosocomial infection control and hospital epidemiology, strategic communication, and related matters.

This new F/P/T network should seek to embody the same collaborative culture that has apparently emerged with the F/P/T Network for Emergency Preparedness and Response or the Canadian Public Health Laboratory Network (see Chapter 6). To that end, the communicable diseases network should be mandated and supported by the F/P/T Conference of Deputy Ministers of Health. Its steering committee would include designates from the relevant provincial or regional centres and leaders of the relevant federal centres.

5E. Recommendations

The Committee recommends that:

5.1 Under the aegis of the new Canadian Agency for Public Health, the Government of Canada should budget for a Communicable Disease Control Fund, allocating a sum rising over 2-3 years to $100 million per annum in support of provincial, territorial, and regional capacity for infectious disease surveillance, outbreak management, and related infection control activities, including the sponsorship of a new F/P/T network. Initial allocations from this Fund should be made to facilitate immediate preparedness for a possible return of SARS to Canada during the winter season of respiratory illnesses and influenza.

5.2 The F/P/T Conference of Deputy Ministers of Health should initiate a new Network for Communicable Disease Control that would link F/P/T activities in infectious disease surveillance, prevention, and management. This initiative should be started as soon as possible, and integrated with the existing F/P/T Network for Emergency Preparedness and Response.

5.3 The Canadian Agency for Public Health, in partnership with the new F/P/T Network for Communicable Disease Control, should give priority to infectious disease surveillance, including provision of technical advice and funding to provincial/territorial jurisdictions and programs to support training of personnel required to implement surveillance programs. The Agency should facilitate the longer-term development of a comprehensive and national public health surveillance system that will collect, analyze, and disseminate laboratory and health care facility data on infectious diseases and non-infectious diseases to relevant stakeholders.

5.4 Assuming some lag time to inception of a new Agency or F/P/T Network, Health Canada and the provinces and territories should urgently commence a process to arrive at business process agreements for collaborative surveillance of infectious diseases and response to outbreaks. The business processes for infectious disease surveillance would be extended over time with support from the Agency's Centre for Surveillance Coordination and the Public Health Partnerships Program, to a national system for non-communicable diseases and population health factors.

To elaborate: the Committee envisages that the system would begin by collecting data on communicable diseases, and extend its ambit to non-communicable diseases as well as relevant population health factors. The surveillance system must be relevant at the local level, with timely reporting and analysis, and flexible enough to adapt to changing needs and different local and institutional circumstances. Such a system must be built so that databases can communicate with one another, and be sufficiently 'low tech' to maximize uptake in hospitals (not least hospital emergency rooms where renewal and upgrading of information systems is urgently needed), clinics and public health units. The system should be modular in both its conception and implementation, but with data collection mechanisms and software structured so as to permit the integration of information into a larger surveillance and public health information system.

The business process agreements for surveillance would cover multiple fronts, including:

a. Developing procedures for uniform and timely reporting of identified infectious diseases, including new pathogens, by local authorities, provinces and territories to Canadian Agency for Public Health. In turn, the Agency should establish a system for rapid determination of diseases that must be reported on a national basis.

b. Identifying relevant surveillance tools and methods as appropriate for health professionals in other settings to input data to the surveillance system (e.g., pharmacy identification of increased use of antidiarrheals, early identification of nursing home or other collective living outbreaks, role of other facilities such as schools in the event of large community outbreaks, linkage of information systems in hospital emergency departments, etc.).

c. Developing standards for data gathering, and protocols for data ownership, data sharing and dissemination.

5.5 Through its own core budget and the Communicable Disease Control Fund, the Canadian Agency for Public Health should support nosocomial infection control, including hospital surveillance, as a priority program. Specific nosocomial infections should be deemed nationally notifiable, and surveillance for them supported by mechanisms for active and passive laboratory surveillance.

As is true for health care more generally, public health has under-invested in information technology for years. Other sectors such as banking and insurance make a several-fold higher investment in information technology as compared to health, notwithstanding the acceleration of investment in recent years. Through Canada Health Infoway Inc., the recent federal Budget provided $600 million in one-time only support to move ahead with the creation of an Electronic Health Record. Comparatively speaking, the needs of surveillance have not received much attention or funding. The presence of a national "blueprint" for health IT, with a concentration on the Electronic Health Record, highlights the need for an approach to health surveillance that is integrated with the clinical systems of the future. The Committee accordingly recommends that:

5.6 The Government of Canada should seek the establishment of a working group under the auspices of the Canada Health Infoway Incorporated and Health Canada and/or the new Canadian Agency for Public Health, to focus specifically on the needs of public health infostructure and potential investments to enhance disease surveillance and link public health and clinical information systems.

We have also highlighted the need to create collaboration between public health emergency capacity, particularly outbreak management, and the broader emergency response capability of F/P/T jurisdictions. The Committee therefore recommends that:

5.7 The F/P/T Network for Emergency Preparedness and Response, in collaboration with the new F/P/T Network for Communicable Disease Control, should urgently move ahead with the development of a comprehensive approach to managing public health emergencies through a pan-Canadian system that includes:

- **harmonizing emergency preparedness and response frameworks at the federal, provincial and territorial levels;**
- **developing seamless planning and response capacities as envisaged by the 31 recommendations of the Special Task Force on Emergency Preparedness and Response;**
- **building an integrated F/P/T planning, training and exercising platform for responding to all-hazard disasters, including public health emergencies created by large-scale disease outbreaks;**
- **developing and applying a common set of principles, concepts and capabilities for large-scale disease outbreaks, and**
- **creating the requisite linkages to major employers, the travel and hotel industry, and relevant NGOs.**

We return to legal issues in Chapter 9. In this context, the Committee recommends that:

5.8 Health Canada in collaboration with provincial/territorial jurisdictions should lead the development of a national legislative and policy framework for a measured, harmonized, and unified response to public health emergencies.

The Committee further recommends that:

5.9 F/P/T governments should develop and provide training programs and tools to support local public health units and institutions in systematically developing, implementing, and evaluating crisis and emergency risk communication strategies.

5.10 The F/P/T Conference of Deputy Ministers of Health should support the continued activity of the F/P/T Network for Emergency Preparedness and Response with a view to enhanced surge capacities in all jurisdictions, including:

- **developing an integrated risk assessment capability for public health emergency response;**
- **assessing the National Emergency Stockpile System [NESS] to optimize its role in supporting the response to large-scale disease outbreaks; and**
- **developing and funding the Health Emergency Response Team concept, including a psychosocial response component, as a practical, flexible mechanism for addressing the need for human resource surge capacity.**

Appendix 5.1
Costing of a Surveillance System

The costs below reflect, first, a reasonably comprehensive system for the surveillance of reportable infectious diseases, with the capability to link to front-line public health case management systems, laboratory systems, and infection control systems. These systems only partly exist and will need to be developed further. To satisfy the needs of public health users and to meet the goals of the renewed National Immunization Strategy, immunization and vaccine adverse event reporting modules will need to be included. It is assumed that modules for disease syndromes and for mass quarantine will be included. Syndromic surveillance for bioterrorism is listed separately.

The costs are incremental, based upon the current state of development of surveillance infrastructure and info-structure in the Population and Public Health Branch.

A second major component is an intelligence dissemination or health alert network system, not unlike that recommended by the Canadian Medical Association in their submission. It would be developed gradually and will ultimately resemble the CDC's Public Health Intelligence Network System. Portal-type capabilities allowing controlled access to a wide range of information will eventually be included. It would provide a fully-featured secure system for high-priority users and a simple e-mail/fax capability for general users.

Total costs are shown: this would be shared in some fashion (according to the type of expenditure, not by formula) between federal and P/T governments. Basic hardware and connectivity costs are not included.

Costs are shown as average yearly costs over a five-year period.

Costing of a Surveillance System for Infectious Disease & Emergencies

	$ millions p.a. (average, over 5 years)
CIPHS/i-PHIS	
Collaborative	2.0
Updates, pilots, rollout	1.8
Modules &/or links:	
inspection/water	0.4
non-infectious (basic)	0.5
lab (link)	0.3
blood-borne infections (link)	0.4
influenza	0.1
quarantine	0.1
immunization/vaccine-preventable diseases/vaccine-associated adverse events	0.6
Lab systems development	2.0
Infection control system development	2.5
Architecture	0.4
Standards	0.7
Policy Issues (privacy, data management)	0.4
Local implementation	7.0
Subtotal	**19.2**
Bioterrorism	
architecture/standards	0.8
public health system development	1.7
feeder systems development	3.0
implementation	5.0
Subtotal	**10.5**
Portal/Health Alert Network	
Consultation/design	0.2
IM/IT development, project management	2.3
Component development	0.8
Implementation & operations	10.0
Subtotal	**13.3**
TOTAL	**43.3**

Five-year total: $215 million

Appendix 5.2
Case Definitions for SARS from Health Canada and Ontario

I. Evolution of Health Canada's SARS Case Definition

March 16: first case definition with a probable case being one who meets the suspect case definition "together with severe progressive respiratory illness suggestive of atypical pneumonia".

Comment section indicates signs/symptoms that may characterize severe progressive respiratory illness and that "chest x-ray changes may or may not be present".

- First Case definition included "Close contact* with a probable case
- Recent history of travel (within 10 days) to Asia, especially in areas reporting cases of SARS (see below)

Areas in Asia Reporting Cases of SARS

China: Guangdong province, Hong Kong SAR

Vietnam: City of Hanoi

Singapore

March 17: "AND No other known cause of current illness" was added to case definition.

March 20: "Persons under observation" is defined and added to case definitions. Recent history of travel (within 10 days) to WHO-reported "affected areas" in Asia is added to suspect case definition (rather than Recent history of travel (within 10 days) to Asia).

March 21: Definition of Persons "under observation" is removed and added to website under "Public Health Measures".

March 31:

- "Close contact* *within 10 days of onset of symptoms* with a probable case" is added to suspect case definition.
- "recent travel to a setting that is associated with a cluster of SARS cases" is added to suspect case definition. This was added to capture exposure sites within Canada (i.e., Toronto).

Areas in Asia with Local Transmission

(March 29, 2003 21:00 EST)

China, including Hong Kong Special Administrative Region

Vietnam: City of Hanoi

Singapore

***Taiwan* [added]**

April 2: "Close contact* within 10 days of onset of symptoms with a *suspect* or probable case" is added to suspect cases definition.

May 14: Wording of Affected area changed slightly "Recent travel within 10 days of onset of symptoms to a WHO-reported "affected area" *outside of Canada* [previously in Asia]

- Table of Areas, OUTSIDE OF Canada listed as "Affected Areas" (with Local Transmission of SARS) included. Case Definitions stayed the same.

May 29: Clinical criteria for a living suspect case stays the same.

- addition of: "A person with unexplained acute respiratory illness resulting in death after 1 November 2002, but on whom no autopsy has been performed" added to suspect case definition
- Recent travel or visit within 10 days of onset of symptoms to a defined setting that is associated with a cluster of SARS cases changed to *"Recent travel or visit to an identified setting in Canada where exposure to SARS may have occurred (e.g., hospital [including any hospital with an occupied SARS unit], household, workplace, school, etc.).** This includes inpatients, employees or visitors to an institution if the exposure setting is an institution."*
- link to Ontario site provided: "***The list of potential SARS exposure sites in the Province of Ontario can be obtained at the following address:* <http://www.health.gov.on.ca/english/public/updates/archives/hu_03/sars/exposure_sites_052703.pdf>"
- Probable case definition changed: *"A suspect case with radiographic evidence of infiltrates consistent with pneumonia or respiratory distress syndrome (RDS) on chest x-ray (CXR)."*

- "Exclusion Criteria strengthened"

A suspect or probable case should be excluded if an alternate diagnosis can *fully explain* their illness.

- Areas, OUTSIDE OF Canada listed as "Areas with recent local transmission" of SARS revised

Chronology of Ontario SARS Case Definitions as per their website

Date	Website	Probable Case Definition	Suspect Case Definition
April 11, 2003	http://ogov.newswire.ca/ontario/GPOE/2003/04/11/c0428.html?lmatch=&lang=_e.html	A probable case is someone who either has chest x-ray findings of pneumonia or Acute Respiratory Distress Syndrome OR is a suspect case with an unexplained respiratory illness resulting in death, with findings of Acute Respiratory Distress Syndrome of unidentifiable cause AND has had close contact with a probable or suspect case of SARS or traveled to Hong Kong, Vietnam, China, Taiwan or Singapore.	A person with a history of high fever (over 38 degrees C) AND respiratory symptoms including cough, shortness of breath, difficulty breathing AND no other known cause of current illness AND has had close contact with a probable or suspect case of SARS or traveled to Hong Kong, Vietnam, China, Taiwan, or Singapore in the last 10 days.
April 29, 2003	http://ogov.newswire.ca/ontario/GPOE/2003/04/29/c5627.html?lmatch=&lang=_e.html	A probable case is someone who either has chest x-ray findings of pneumonia or Acute Respiratory Distress Syndrome OR is a suspect case with an unexplained respiratory illness resulting in death, with findings of Acute Respiratory Distress syndrome of unidentifiable cause AND has had close contact with a probable or suspect case of SARS or traveled to Hong Kong, Vietnam, China, Taiwan or Singapore *in the last 10 days.*	No change
May 26, 2003	http://www.health.gov.on.ca/english/public/updates/archives/hu_03/sars_stats/stat_052603.pdf	A person meeting the suspect case definition together with progressive respiratory illness suggestive of atypical pneumonia or acute respiratory distress syndrome with no known cause OR a person meeting the suspect case definition with an unexplained respiratory illness resulting in death, with an autopsy examination demonstrating the pathology of acute respiratory distress syndrome with no known cause.	A person presenting with a fever (over 38 degrees Celsius) AND one or more respiratory symptoms including cough, shortness of breath, difficulty breathing, AND one or more of the following: 1) close contact* within 10 days of onset with a suspect or probable case; 2) recent travel within 10 days of onset of symptoms to a WHO reported "affected area" outside of Canada (see WHO website for latest information: http://www.who.int/csr/sars/en/); 3) recent travel or visit within 10 days of onset of symptoms to a defined setting that is associated with a cluster of SARS AND no other known cause of current illness.

* Close contact means having cared for, lived with or had face-to-face (within 1 metre) contact with, or having had direct contact with respiratory secretions and/or other body fluids of a person with SARS.

Appendix 5.3
Some Steps toward Achieving Seamless Outbreak Management in Canada

Either memoranda of agreement or legislative arrangements should be developed among Health Canada and all P/T jurisdictions laying out protocols covering all aspects of the conduct of the management of significant outbreaks, as below:

- agreement on roles and responsibilities;
- agreement on data ownership, custody, sharing; the aim should be to facilitate greater sharing of data;
- prior agreement on the use of data for publication and authorship must be included;
- clear identification of persons responsible for (a) management of the outbreak, (b) data management, and (c) communications;
- prior agreement on the general outline of information management elements (standards, definitions, etc.), based on accepted standards, with one person responsible for authorizing elaborations of these elements, and enforcing their use;
- development of a shared 'B-team' function, with separate teams responsible for front-line outbreak containment, epidemiology and data analysis, and 'sober second thoughts/hypothesis generation';
- agreed strategy and workplan to ensure interoperability of all information systems concerned with infectious diseases in hospital and public health;
- sharing of information to be by access to a common database rather than through transmission of data; and
- uniform adoption of highly flexible and interoperable data platforms, that allow sharing of public health information, capture of clinical information from hospitals, and integration into an outbreak management database platform.

Chapter 6

STRENGTHENING THE ROLE OF LABORATORIES IN PUBLIC HEALTH AND PUBLIC HEALTH EMERGENCIES

Laboratory issues were highlighted in briefs received from the Canadian Association of Medical Microbiologists, the Canadian Infectious Diseases Society, the Canadian Society for Medical Laboratory Science, and the Ontario Association of Medical Laboratories. The SARS experience has clearly illustrated the central role that public health laboratories play in both public health and the health care system. Serving sometimes as first-line testing facility when a novel agent emerges, and at other times as a reference centre or 'court of last resort' to standardize and improve testing procedures for unusual pathogens, public health laboratories are a key resource in infectious disease diagnosis, surveillance, and epidemic response. Public health laboratories also have potential functions in chronic disease surveillance and diagnosis that could grow in the years ahead as more links are established between apparently non-communicable diseases and a variety of pathogens.

6A. Key Activities of Laboratories

Canada has a wide variety of medical laboratories, organized variously under the ownership and management of investor-owned corporations, non-profit hospitals and health regions, or various levels of government in the form of public health laboratories. The list of activities below applies particularly to a public health laboratory, but other types of laboratories carry out some of these functions:

- Diagnosis of infections
- Characterization of micro-organisms
- Reference services
- Support to epidemiologic surveillance and epidemic investigation
- Participating in, conducting or coordinating laboratory surveillance of infectious diseases
- Environmental surveillance
- Emergency preparedness and response
- Applied research and development
- Fundamental research

While discharging these functions, public health laboratories are integrated with the wider public health team. They play important roles in providing information for public health policy, training health human resources, and public health research.

A brief description of each of the key functions may provide the reader with a better understanding and appreciation of the role of laboratories in public health.

6A.1 Diagnosis of Infections

There is a public health dimension to all communicable diseases and to some related infectious disease issues (e.g., nosocomial infections and antimicrobial resistance). In Canada, diagnostic services for infectious diseases can be provided by private laboratories, hospital laboratories, provincial laboratories or national laboratories. The most frequent infectious diseases, such as lower urinary tract infections (cystitis), skin infections (impetigo, carbuncles, cellulitis), typical community-acquired pneumonias, and upper respiratory tract infections (pharyngitis, laryngitis, sinusitis), are all diagnosed using microbiological techniques available in private laboratories or hospital laboratories. The role of private laboratories varies widely. In some provinces, they mainly provide diagnostic services to community-based physicians. In others, they also have a significant role in providing services to hospitals, and major hospitals have developed public-private partnerships with investor-owned laboratory service providers.

Less common infections are diagnosed in laboratories at either the provincial or national levels. In cases of new diseases such as West Nile virus and SARS, or rare diseases such as Hantavirus and Ebola virus, the National Microbiology Laboratory [NML] at times takes on the role of front-line diagnostic laboratory. This occurs when the NML receives specimens for testing directly from health care institutions, a situation that arises when it is the only laboratory in the country able to provide the required testing for reasons of economy of scale or requirements for high levels of containment. In many instances, this is a time-limited role as other laboratories become proficient in testing for these rare or dangerous agents, or tests become commercially available. The NML may also play a role in facilitating the adoption of new testing technology by hospital or provincial public health laboratories.

6A.2 Characterization of Micro-organisms

Detailed characterization of organisms is a frequent function of public health laboratories. There are many important reasons for characterizing organisms associated with infection. These include gaining an understanding of a class of organisms' susceptibility to treatments so that appropriate treatment choices can be made, understanding the relatedness of organisms of the same class and thus possible common sources of infection, and determining how an organism is causing disease and predicting risks of infectious disease outbreaks. Different types of characterization are generally performed by different types of laboratories in the health care or public health system. As with other areas of public health, this function has suffered from a lack of coordination and problems with data sharing.

6A.3 Reference Microbiology

Reference microbiology includes activities such as confirmation of the identification of rarer organisms, organizing and coordinating quality assurance, and proficiency testing programs. All laboratories require some kind of reference function. Provincial public health laboratories may provide this function for laboratories in their jurisdiction and the NML provides reference microbiology services to all provincial laboratories as well as some international reference activities. In the absence of resources for developmental work at provincial laboratories, reference microbiology has been provided by some academic hospital laboratories. Thus, Canadian reference laboratory systems are *ad hoc* and not well-coordinated.

6A.4 Support to Epidemiologic Surveillance

Almost all infectious disease surveillance involves a laboratory test at some stage, as clinical diagnosis in and of itself is seldom deemed definitive. In Canada, national surveillance systems for different infectious diseases have evolved independently of each other, and are largely stand-alone. The type of laboratory testing required for a given surveillance system determines where testing can be done. For some infections (meningitis, Creutzfeldt-Jakob Disease [CJD]), all specimens are tested at the national level. For others such as influenza, initial isolation is performed at the provincial level and a sample is referred to the National Microbiology Laboratory for sub-typing. This practice extends to many areas such as surveillance of vaccine adverse events (now being planned), vaccine failures or antiviral drug treatment failures.

At times, the sampling frame for surveillance is systematic and at other times it is not. For some diseases, a laboratory result generated on the front line or in provincial laboratories becomes part of an epidemiologic report and contributes to a deeper understanding of a particular emerging disease or outbreak. New techniques have allowed 'molecular finger-printing' of organisms to establish their epidemiologic relationships, as in different strains of the SARS virus. These techniques can also be important in linking severity of infections to subtle differences in viruses or bacteria that otherwise appear to be part of the same family.

Unfortunately, these types of activities are again not well-coordinated; Canada continually loses opportunities to advance knowledge or improve its own management of infectious diseases by failing to aggregate these data in a coherent laboratory-linked surveillance system. As a corollary, while there is considerable laboratory input into infectious disease surveillance systems, closer links are needed to surveillance in general. The case for better integration of laboratory and epidemiologic activities in Canada was highlighted by multiple stakeholders, including the Canadian Society for Medical Laboratory Science, the Canadian Infectious Disease Society, Canadian Association of Medical Microbiologists, and the Ontario Association of Medical Laboratories. As well, it is clear that better standardization of laboratory testing would improve the comparability of results, and mitigate either uncertainty or the need for repeat testing.

6A.5 Laboratory Surveillance

Some types of surveillance are primarily laboratory-based. West Nile virus is one example. The National Microbiology Laboratory performed all testing of dead birds and mosquitoes over the first three years; testing has since largely devolved to provincial laboratories. Other types of surveillance that are primarily laboratory-based include molecular finger-printing of foodborne organisms, and determination of antimicrobial resistance.

Most laboratory surveillance systems are passive, that is, they rely on submitted biologic material to make inferences. If patients with signs of a particular infection are not tested, or if they are tested in laboratories that are not part of a surveillance network, then information is lost. Epidemiologists regard passive surveillance as flawed in that it lacks a systematic sampling frame, clear definition of denominators, and assurance that laboratory information can be integrated with standardized epidemiologic and clinical information. The outputs of a passive surveillance system have limited utility. Canada needs more active laboratory surveillance with known sampling frames and better denominator data to strengthen our ability to anticipate, detect and respond to infectious disease threats.

More timely and sensitive laboratory surveillance for many infectious diseases is entirely feasible by marrying advances in information technology with advances in molecular typing of organisms.

Consider the current sequence of events for a reportable disease of national interest: a patient with a particular clinical syndrome presents to a physician. The physician orders a laboratory test. The test is performed by a local private laboratory, or perhaps in a hospital laboratory. The laboratory reports the test to the attending physician, who in turn reports the case to local public health, and this in turn is reported provincially and ultimately nationally. This system can take from a few days up to several weeks before case counts cumulate to the national level, and it is particularly weak for timely recognition of multi-jurisdictional outbreaks.

More timely detection can only be achieved through linking laboratories. The Canadian Public Health Laboratory Network [CPHLN] is putting such a network in place for enteric diseases, bioterrorism and other events. Although it is several years behind the United States' PulseNet, the enteric disease surveillance system, PulseNet Canada is close to being operational.

It is ultimately possible for all provincial laboratories and some major academic medical centres to use common technology platforms and typing procedures, and then be linked in real time over the Internet to provide surveillance information on key infectious diseases. Multiple stakeholders encouraged the creation of this type of integrated information platform. Persuading laboratory stakeholders to participate in these types of systems is a matter of finding the right inducements or mutual advantages. As discussed below, a private US company, Focus Technologies, was able to gain participation of many Canadian hospitals in a system to monitor antimicrobial resistance simply by providing continuous feedback to the hospital laboratories from a shared databank. Similar inducements could foster the creation of a national public health laboratory system that would serve as an integral part of a seamless national public health system.

6A.6 Environmental Surveillance

Food and water safety monitoring are key parts of the laboratory surveillance system, as the Walkerton and North Battleford outbreaks have reminded us. This part of the system is delivered very differently in different jurisdictions. Water testing is often devolved to the local level and responsibility is spread through different ministries. Similarly, food safety testing is spread across provincial and federal agencies including Health Canada and the Canadian Food Inspection Agency.

In general, food and water safety surveillance in Canada is at a fairly rudimentary state of development. The BSE situation in Alberta has forcefully demonstrated that failure to adequately monitor food safety can be economically catastrophic for national industries. For environmental monitoring, public health laboratories must be able not only to detect infectious agents, but also unusual toxins from non-infectious sources that may or may not be food- or water-borne.

6A.7 Chronic Disease Surveillance

While the public health laboratory system is largely concerned with infectious diseases, there are some well established chronic disease surveillance systems—screening for phenylketonuria and hypothyroidism, for instance—that may be performed by provincial public health laboratories. In other jurisdictions, these functions are provided by individual hospital laboratories.

The role of public health laboratories in chronic disease surveillance is likely to change in the near term. Two decades ago, few physicians would have imagined that peptic ulcer disease was integrally linked to infection with *Helicobacter pylori*. More and more chronic diseases now seem to be caused by infections or at least have infectious cofactors. Human papillomavirus has been linked to cervical cancer, and hepatitis viruses are major causes of hepatic cancer. At the same time, strong genetic risk factors for chronic diseases have been identified (Brca genes for breast cancer). What may emerge is a new integrative approach to preventing chronic diseases. For example, instead of cytological screening for cervical cancer with Pap smears, physicians and nurse practitioners may test for Human papillomavirus and genetic factors that predispose to progression to cervical cancer in the face of a chronic infection. Prions may turn out to be involved in various chronic diseases. These developments again highlight the need for a laboratory system that is integrated with the goals of both public health and clinical care.

Unfortunately, Canada has undertaken no national planning for these types of novel programs and there is virtually no federal presence in these cutting-edge fields. The current window of opportunity will close quickly, as a variety of local screening programs and market-driven testing strategies appear. Ample room must be left for pluralism and innovation, but Canada should move ahead to develop a public health strategy that can anticipate and channel these new surveillance opportunities.

6A.8 Emergency Preparedness and Response

Public health laboratories are tasked with preparedness and response to any infectious disease emergency or large epidemic. Related activities include participation in planning for emergencies (Viral Hemorrhagic Fever Emergency Response Plan, Pandemic Influenza Plan, Smallpox Plan), exercises, development of diagnostics, training and equipping other laboratories, stockpiling of reagents, coordination of laboratory networks, provision of surge capacity to other laboratories and participation in biologic terrorism preparedness at special events (G8 Summit in Kananaskis and World Youth Day in Toronto) and finally front-line response to infectious disease in Canada and elsewhere. Many of these activities— e.g., bioterrorism, West Nile virus, SARS—are new mandates for public health laboratories. And very often the new mandate is an unfunded one.

The Canadian Association of Medical Microbiologists and Canadian Society for Medical Laboratory Science both emphasized the need for advance planning that would provide the required capacity and funding for laboratories to deal effectively with infectious outbreaks, bioterrorism, or other workload surges.

6A.9 Applied Research

As technology changes and new infectious diseases emerge, an increasingly important role for public health laboratories is applied research on the diagnosis and detection of infectious diseases. This includes evaluation of new commercially-available diagnostic tests, development of in-house diagnostics, and research aimed at answering specific public health questions. As discussed in detail in Chapter 10, the capacity for research in public health laboratories has been weak for many years and has, if anything, eroded further in the last decade. This must be remedied.

6A.10 Fundamental Research

Fundamental research is a key activity for public health laboratories for several reasons. First, fundamental research has merit in its own right. Absent investments in fundamental research capacity, Canada would not have had the technology and expertise required to isolate and sequence the SARS coronavirus so rapidly. Second, public health laboratories have unique resources and their research facilities can answer important scientific questions of relevance to the health of Canadians. Third, the excitement of research opportunities will unquestionably help to draw talent to public health laboratories. And, as the SARS experience has so vividly illustrated, maintaining cutting-edge scientific expertise is important in the response to emergencies.

Significant involvement in fundamental curiosity-driven research is a public health laboratory function that has withered. Most public health laboratories view basic science research as someone else's job. Within Health Canada, this kind of research was actively discouraged until research became a clear part of the mandate of Health Canada scientists with realignment in June 2000. These mandates must be protected and expanded in the new Canadian Agency for Public Health.

6B. The Public Health Laboratory System in Canada

As noted, four levels of laboratories form the public health laboratory system in Canada. These are private, local and hospital laboratories, provincial public health laboratories, national laboratories and international laboratory networks. In some provinces, hospital and provincial laboratories are integrated. These different levels of laboratories function as a hierarchy, although there are no formal reporting relationships or requirements. Usually, the sophistication and breadth of diagnostic capacity and scientific expertise increases at higher levels in the system. In an epidemic or an emergency, these different levels of laboratories may be supplemented or complemented by laboratories that are primarily based in academic institutions and whose primary role is research. This was clearly the case in the Toronto SARS outbreak, where, as noted in Chapter 2, teaching hospital laboratories took on the task of polymerase chain reaction [PCR] testing to offload the Central Provincial Public Health Laboratory.

The role of the different laboratory levels in surveillance and response to an epidemic is dynamic, varying with the disease or stage of an epidemic and with the state of development of diagnostics. For instance, for very common diseases, diagnostics are usually available at the first contact laboratory while for rare diseases diagnostic testing may only be available at one laboratory. Commercially available diagnostic testing is more likely to be used at the local or hospital level while in-house diagnostics are more likely to be used farther up in the hierarchy.

6B.1 Front-line Laboratories (Private, Local and Hospital Laboratories)

First-contact or front-line laboratories, which may be private, local or hospital-based, function primarily to diagnose infections and are not technically part of the formal public health system. However, there are public health obligations on them for the reporting of notifiable diseases. The use of notifiable disease legislation is a major mechanism for provincial laboratories and epidemiology programs to obtain data from front-line laboratories. In addition, hospital laboratories are a key part of the response to institutional outbreaks of infection. In front-line laboratories, specimens are mainly derived from ill patients and are submitted for a battery of specific diagnostic tests. In general, these diagnostics focus on bacterial diseases and in many instances traditional technologies are used. However, the testing technology varies with the interest, expertise and resources of the individual laboratories. Some front-line laboratories perform a considerable amount of viral diagnostics as well.

Many front-line laboratory services for infectious diseases have been privatized to achieve cost savings. This has created some problems since private laboratories are reluctant to perform many labour-intensive, low-profit-margin tests. Privatization may also make it more difficult to perform certain kinds of surveillance given the scope of new federal privacy legislation (see Chapter 9).

Front-line laboratories normally have a complement of one or at most a few professional laboratory scientists and a number of technologists. In major teaching hospitals, these laboratories are larger and may play a major academic role in training and research. In smaller centres, these laboratories may be supervised by general pathologists with very little training in microbiology.

Although local and hospital laboratories initially identify many infectious disease outbreaks, their involvement in national surveillance systems is generally through their respective provincial laboratories. The hierarchical system where biologic material is moved from one level in the system to the next for more comprehensive testing is very cumbersome and slow. The closer to the front line that an infection can be diagnosed, the more timely the detection of infectious disease threats will be.

As already indicated, these front-line laboratories could play a much greater role in infectious disease surveillance and outbreak detection. They could be a part of a mechanism for real-time sensing of infectious disease threats, and also play a key role in epidemic response. SARS was primarily a nosocomial outbreak, but patients come from and return to communities; infection control cannot stop at the hospital's walls. A further reason for greater integration of front-line laboratories into the public health sphere is that, in major academic centres, these laboratories have significant expertise that is essential for creating a seamless public health network.

Any move to achieve better integration and a more functional laboratory system will raise issues of standardized testing methods, information technology, data sharing and funding. These issues must be faced and can be managed. As one example of the necessary alignment of incentives, Focus Technologies Inc. successfully gained the participation of several Canadian hospital laboratories in monitoring antimicrobial resistance by a data-sharing scheme. Hospital laboratories provided data on antimicrobial resistance to the company at no charge but were then able to view their institution's antimicrobial resistance patterns in comparison to others. The company later marketed the overall data. Focus is no longer active in Canada, but the precedent is important. Public health authorities and health care administrators must work together to create the necessary incentives for institutional participation in regional, provincial, and national programs.

A start has been made on integrating front-line laboratories into the public health system, specifically in the area of monitoring antimicrobial resistance, through the establishment of networks for surveillance of antimicrobial resistance. Health Canada's Nosocomial and Occupational Infections Section has been successful in building close links with leading specialists and institutions; further networking is possible and has already been identified as a priority for action and funding in Chapter 5. As well, the CPHLN plans to integrate local and hospital laboratories into an envisioned three-tiered bioterrorism response network, with local and hospital laboratories playing a key 'sensor' role. Thus far, these activities have progressed slowly because of a lack of resources. The funding programs of the Canadian Agency for Public Health (especially the Communicable Disease Control Fund) and the proposed F/P/T Network for Communicable Disease Control are both mechanisms to accelerate these initiatives.

6B.2 Provincial Laboratories

All provinces have provincial public health laboratories with the exception of New Brunswick. In New Brunswick, the functions of a provincial laboratory are performed by two different hospital laboratories. Provincial laboratories operate within the realm of public health, but there are many different models. In British Columbia, the provincial laboratory is part of the British Columbia Centre for Disease Control [BC CDC] with integrated infectious disease epidemiology and laboratory programs. In Nova Scotia and Alberta, the provincial laboratories are merged with a hospital laboratory. In Manitoba, Saskatchewan, Quebec, Ontario and Newfoundland, organizationally and physically separate laboratories exist. Some provincial laboratories have multiple sites within the province. These smaller laboratories would typically have a few professional microbiologists whose involvement in research and development is relatively limited.

In every province, there are different relationships with local academic institutions and hospital laboratories. In this "system", the functions and services provided by provincial laboratories vary considerably. Among the functions provided are reference services for local laboratories within their jurisdiction, and primary diagnosis for certain infections (often viral disease diagnostics are centralized). The territories are served by provincial laboratories under contract arrangements with Nunavut being served by Ontario, the Northwest Territories by Alberta, and Yukon by the BC CDC.

Provincial laboratories face a number of challenges. Their relationship with hospital and private laboratories across the country is variable; it ranges from a quasi-regulatory oversight role in Quebec to collaborative relationships or even competitive positioning in other jurisdictions. One reason for strained relationships is that, whether owing to budget cuts to public health laboratories or advances in technology, hospital laboratories are now undertaking more and more testing activities that were once fulfilled only by public health laboratories. This has led, in some circles, to a negative spiral as decision makers infer that public health laboratories can indeed be safely downsized. However, the resulting loss of capacity to respond to emerging infectious diseases is not replaceable by private or hospital laboratories in the absence of a whole series of prior agreements with these entities.

The Committee's view is that strong provincial laboratories remain an essential component of the public health system. The Communicable Disease Control Fund and F/P/T Network for Communicable Disease Control offer mechanisms for coordinated upgrading of these laboratories, with clearer definition of their roles in the referral hierarchy.

6B.3 National Laboratories and National Laboratory Networks

Within Health Canada, a number of laboratories are involved in infectious diseases. The primary laboratories are the National Microbiology Laboratory [NML] in Winnipeg, the Laboratory for Foodborne Zoonoses [LFZ] in Guelph and the National Laboratory for Retroviruses in Ottawa. These laboratories all reside within the Population and Public Health Branch and would be part of the new Canadian Agency for Public Health.

These laboratories serve multiple functions including front-line diagnostics (for new or rare diseases), reference microbiology (confirming test results and quality assurance), support to epidemiologic surveillance, conducting and coordinating laboratory surveillance, emergency preparedness and response, and applied and fundamental research.

The LFZ in Guelph focuses on the animal side of foodborne zoonotics, while the Retrovirology Laboratory specifically deals with HIV and related viruses. The LFZ also has laboratories in St.Hyacinthe, Quebec and Lethbridge, Alberta.

These laboratories have testing capacity that is generally more sophisticated than the provincial laboratories, and are staffed by a significant number of PhD or MD trained scientists. In addition to the operations in Winnipeg, the NML provides modest support to six national reference centres based mainly in provincial laboratories. These reference centres have developed for a variety of reasons over the years; they provide specialized services not available at the NML and have developed significant expertise in selected areas. For instance, the Alberta provincial laboratory provides national reference services for streptococcal infections. This model of shared F/P/T expertise is entirely consistent with both the vision for the distributed functions of the Canadian Agency for Public Health set out in Chapter 4 and the anticipated workings of the new F/P/T Network for Communicable Disease Control.

As part of its role, the NML plays a key role in a cluster of federal and provincial laboratories that are part of Canada's bioterrorism response. Because of the need to provide surge capacity to the provinces and front-line response anywhere in the world, two multidisciplinary laboratory response teams have been established at the NML and equipped with portable laboratories capable of performing routine and molecular diagnostics in high containment. One team is on call at all times and a team can be on the way to the field in as little as three hours. The Canadian Association of Medical Microbiologists highlighted the importance of such rapid response teams, particularly if they can combine laboratory and epidemiologic expertise. The NML teams have been fully deployed only three times—once to New Brunswick, once to Kananaskis, and once to Hong Kong to assist in the investigation of the Metropole Hotel and Amoy Gardens clusters of SARS cases.

Provincial and hospital laboratories have their own unique strengths, but do look to the NML for national leadership in laboratory issues related to infectious diseases. The NML provides coordination on a number of aspects of laboratory surveillance across the country. A key development over the last two years is the establishment of a new working relationship with provincial laboratories through the CPHLN. The CPHLN's draft terms of reference are attached in Appendix 6.1. This body is made up of the directors of the provincial laboratories; the Scientific Directors of the NML, the LFZ, and the National Retrovirus Laboratory; as well as leaders of the federal Centre for Infectious Disease Prevention and Control [CIDPC] and the Centre for Surveillance Coordination and Response. It is functioning increasingly as a national coordinating body, reflecting the modus operandi that the Committee hopes can be achieved more widely in the Network for Communicable Disease Control and beyond. Not only has F/P/T collaboration in the CPHLN been strong, but its importance was endorsed by non-governmental stakeholder submissions.

For provincial laboratory directors, the CPHLN offers opportunities both to provide input to Health Canada's programs and to share expertise in a national peer-to-peer network. For the NML, the CPHLN provides a useful mechanism for communicating with and learning from provincial laboratories, drawing on expertise that it does not necessarily have and implementing national programs. If CPHLN continues to be successful, ultimately it could be a single point of contact between federal and provincial public health laboratories for all work on issues pertaining to infectious diseases.

The NML houses and funds the CPHLN, but importantly, it is chaired by a provincial laboratory director. The CPHLN is gradually beginning to coordinate federal-provincial laboratory programming in a number of areas, key ones being bioterrorism, real-time molecular fingerprinting of *E.coli* and Salmonella, and food and water safety. As all jurisdictions move forward to strengthen the fabric of the nation's public health systems, the CPHLN should in turn be strengthened and expanded. Supported by new federal funds and linked to the new F/P/T Network for Communicable Disease Control, it should serve as another exemplar for how national programs can be planned and implemented in Canada's complex multi-jurisdictional environment.

6B.4 International Laboratory Networks

Several international laboratory networks have arisen from the need for combined firepower and rapid communication among scientists in epidemic situations. Canada's national laboratories have extensive links to their counterparts in other countries.

Strong links to the US CDC exist for virtually all programs. This has been enormously important over the years in developing Canadian capacity. Canada, through the NML and Defence R&D Canada at Suffield, Alberta, is a member of the US CDC-led Laboratory Response Network, charged with responding to the threat posed by biological and chemical weapons and related terrorist activities. The NML is also a member of the US CDC-based PulseNet, a molecular typing network for enteric pathogens. As noted above, PulseNet Canada is moving forward steadily. Recently, it was agreed that the NML and the CIDPC should create a formal liaison with the US CDC's National Center for Infectious Diseases; this is underway.

Canada also participates in several different virology networks including the European Viral Diseases Network and the International High Security Laboratory Network. The latter includes the level 4 laboratory programs from Canada, the USA, Germany, France, Italy, the UK, South Africa, Australia, Japan, and Russia. After September 11, 2001, the Ministers/Secretaries of Health of the G7 countries and Mexico established the Global Health Security Action Group, which includes a laboratory network chaired by Canada, to respond to bioterrorism. This network's ambit has now been expanded to include pandemic influenza.

Although the World Health Organization itself has no laboratories, it organized an international network of more than ten laboratories responding to SARS, including all affected countries plus experts from some other countries. The network led to unprecedented, extensive, and generous sharing of data and procedures. This resulted in very rapid progress on the laboratory front. The international laboratory network exemplifies some of the best practices and precedents from the SARS experience internationally.

6C. Analysis of the Laboratory Response to SARS

The laboratory response to identifying the causative agent of SARS was one of the most visible parts of the epidemic response in Canada. The informal hierarchy identified above has not yielded a public health laboratory system, and the extant arrangements were not well-structured for investigating and responding to an outbreak. Instead, Canadian biomedical laboratories are structured to support the diagnosis of infection in individuals. However, the system was able to adapt to the different demands of the SARS outbreak. The inner workings of the NML likewise were not designed for an epidemic response, and changes in the way the NML operated were required for the national laboratory to respond effectively.

The 'discovery' phase of the laboratory response consisted of ruling out known agents as the cause of SARS and identifying the causative agent. In doing this through the CPHLN, agreement on the types of specimens to be obtained and specimen shipping protocols was reached very quickly. The network agreed that testing for known agents would be performed at the provincial laboratories, mainly Ontario and British Columbia, allowing the NML to focus on unknown agents. The CPHLN was also able to provide useful advice to scientists at the NML in directions for research. These steps were taken extremely rapidly; within two weeks, the SARS coronavirus had been identified and the laboratory role shifted to one of diagnosis of coronavirus infection, development of diagnostic tests, and research on the agent.

As the laboratory response developed, investigations into the cause of SARS were highly centralized at the NML. The centralization of biologic material and laboratory results yielded a clearer picture of all the data on causation, notwithstanding the disappointing lack of associated clinical and epidemiologic data. A further advantage of unified leadership was that laboratory studies were readily coordinated, avoiding duplication and directing maximum effort at the most important issues. However, predictably, moving specimens through the hierarchy from hospital laboratory to provincial laboratory to national laboratory slowed down investigations. On occasion, specimens were received at the NML two to four weeks after they were first obtained. For other individuals with probable SARS, reference specimens were never received at the NML.

During the early phases of the SARS epidemic there were several significant impediments to an effective laboratory response. The two most important were inadequate data management and the lack of clinical and epidemiologic data.

Data management: The NML had no laboratory-wide laboratory information system. In spite of many years spent in developing a Laboratory Data Management System by Health Canada, the extant system could not serve the epidemic response needs. A new database had to be created from scratch, and was made accessible to laboratories in the CPHLN over the Internet. This experience highlights the need for software platforms that are agile, modular, and rapidly modifiable for special purposes. More often than not, grand and purpose-built architectural designs in software development are overtaken by faster-moving and smaller platforms that can be customized to the changing needs of users. The challenge, as always, is to balance considerations of flexibility, economy, integration, and interoperability. For the future, laboratory databases that can communicate with one another must be established in public health laboratories across the country. If a global system cannot be achieved, then at a minimum a common information management system for outbreak responses should be established.

The lack of integration of epidemiologic and laboratory data: As Chapters 2 and 5 have already highlighted, laboratory data were not well-integrated with epidemiologic data during the SARS outbreak in Canada. This objective has still not been fully achieved, with severe adverse effects on research that will be further reviewed in Chapter 10. An integrated laboratory and epidemiologic data management system is indeed achievable, at least for outbreak response. Such a system should have been in place before SARS, and must now be established as soon as possible. This shortcoming points to the general need for greater integration of laboratory and epidemiologic sciences in a renewed public health system.

Once the potential causative link to the new coronavirus became clear, the role of the NML shifted to performing diagnostic testing, development of further diagnostic tests, supporting provincial and other laboratories with their own diagnostics, and reporting results. The NML initially provided coronavirus PCR primer sequence information to the CPHLN and engineered a positive control for PCR testing. The plan of the CPHLN was to rapidly devolve testing capacity to provincial laboratories. However, at the same time, provincial, hospital and academic laboratories began developing their own testing based on published sequences of the coronavirus and material obtained from ill patients. This resulted in some chaos and duplication as individual scientists and laboratories went their own way.

For example, several coronavirus genes from the same Tor2 isolate have been cloned and expressed multiple times and are now being used in diagnostic tests across the country. On the positive side, the agile response of hospitals and provincial laboratories is important and encouraging. On the negative side, the development of multiple diagnostics is somewhat wasteful and has led to the proliferation of diagnostic tests that, notwithstanding a common genetic platform, may not have equal sensitivity and specificity. Perhaps more importantly, when multiple laboratories are providing testing in an uncoordinated manner without sharing data, the ability to see the whole picture of the epidemic is lost. If this development had been anticipated, mechanisms for coordination and reduction of duplication could have been put in place, along with a centralized database for all laboratory results.

This is yet another lesson from SARS. For the future, better coordination of efforts must be achieved through extension of the CPHLN membership to major hospital laboratories, the development of stronger provincial networks of laboratories, or both.

Once laboratory results of coronavirus testing became available, there were some new issues around reporting of results. Although results of testing were available, the release of results to physicians and public health units was at times delayed in the Ontario Ministry of Health and Long-Term Care [OMHLTC]. We have not determined the extent or duration of these delays. The Committee leaves it to the Campbell Investigation to determine the impact of these delays, if any, on the second wave of SARS in Toronto.

A related difficulty arose from the fact that 172 individuals, primarily from Ontario, tested positive for the SARS coronavirus, but were not classified as probable or suspect SARS. As of mid-August it is still not known if these individuals actually had some form of the infection, how they acquired it, and if they produced additional chains of transmission. Collaborative work is currently underway with the OMHLTC to pursue the matter. This information was and remains critical to determining whether there was hidden community transmission of the SARS coronavirus and describing the full spectrum of disease caused by the virus.

The reporting of results to individual physicians was also problematic. For hospitalized patients who were discharged or died, results of laboratory tests were sent directly to medical records and in some instances were not seen by the physicians who cared for the patient. This illustrates the inadequacies not only of laboratory information systems, but also the weak interface between public health and the health care system. In effect, no system exists to pull important information together into a coherent picture of an outbreak. This situation again illustrates that the data systems and business processes in place for managing day-to-day infectious disease problems are ill-suited to responding to epidemics. Different operational procedures need to be put in place urgently for an effective outbreak or epidemic response.

6D. The Ideal Public Health Laboratory System for Canada

Ideally, Canada should have a fully coordinated and integrated national public health laboratory system that delivers timely surveillance for infectious disease threats, is an active participant in infectious disease prevention programs, and responds effectively and quickly to infectious disease outbreaks.

Achieving this vision depends on strong regional or provincial public health laboratories that are closely linked to front-line laboratories and other organizations involved in public health through funding streams, collaborative agreements, common or related testing procedures, shared or interoperable information systems and common programming. Such a configuration would help to bring public health back into the health care system. These laboratories should be integrated with epidemiologic components of public health in regional or provincial agencies, helping to reinforce the second-line of defence against public health hazards. As such, they should be supported by the new Communicable Disease Control Fund in the Canadian Agency for Public Health and linked together through both the CPHLN and the new F/P/T Network for Communicable Disease Control. These laboratories should also be closely tied to scientists in academic institutions. Testing for important infectious disease agents must be performed through common testing procedures at the lowest level possible within the integrated laboratory system, with results of interest reported to the regional and ultimately the national level in real time through integrated information management systems.

Whenever possible, the regional laboratory would take on leadership, coordination, and research roles in the network rather than performing high volumes of testing on site. Expertise and innovation capacity should be distributed across the network, with each regional laboratory developing national expertise in given areas, as outlined earlier. The laboratory elements in the Canadian Agency for Public Health would be an integral part of the network. In particular, the new federal agency must itself maintain world-class laboratory science capacity, and its laboratory leaders in turn should have a mandate to build regional public health capacity and play a major role in coordinating national surveillance and epidemic responses.

To achieve this vision, significant inducements need to be identified for front-line laboratories to become part of regional laboratory networks and for provincial public health laboratories to develop programs that fit into an integrated national system. The Communicable Disease Control Fund described in Chapter 5 would support these aims, and the proposed F/P/T Network for Communicable Disease Control would lend momentum to the integration of laboratory and epidemiologic functions.

6E. Recommendations

The SARS experience has highlighted the importance of public health laboratories in surveillance for infectious disease and the central role of these laboratories in the response to epidemics. In some respects, the laboratory response to SARS went well. Its relative success was a function of significant capacity at the national level, effective F/P/T laboratory working relationships, pre-existing functional networks, and a culture of mutual respect and assistance among the provincial and national laboratories. These prerequisites for success should be emulated in other parts of the public health system. We have identified a number of challenges and issues in Canada's public health laboratory system. The Committee accordingly recommends that:

6.1 The F/P/T Conference of Deputy Ministers of Health should urgently launch an expedited review to ensure that the public health laboratories in Canada have the appropriate capacity and protocols to respond effectively and collaboratively to the next serious outbreak of infectious disease. The review could be initiated through the Canadian Public Health Laboratory Network and engage with the new F/P/T Network for Communicable Disease Control as soon as the latter is operational.

6.2 Health Canada, in collaboration with the relevant provincial/territorial authorities, should urgently initiate the development of a laboratory information system capable of meeting the information management needs of a major outbreak or epidemic. The laboratory information system must be designed in such a way as to address the functional needs of laboratories, be readily integrated with epidemiologic information, and be aligned with data-sharing agreements across jurisdictions and institutions.

6.3 The F/P/T Conference of Deputy Ministers of Health should launch a full review of the role of laboratories in national infectious disease surveillance systems, with the aim of creating a more efficient, timely, and integrated platform for use of both public and private laboratories in surveillance.

6.4 The Government of Canada, through the Canadian Agency for Public Health, should invest in the expansion of the Canadian Public Health Laboratory Network to integrate hospital and community-based laboratories. This includes alignment of incentives and

clarification of roles and responsibilities for infectious disease control. The relevant monies could flow from the Public Health Partnerships Program or the Communicable Disease Control Fund (see Chapter 5).

6.5 **The Canadian Agency for Public Health should give priority to strengthening the capacity of provincial/territorial laboratories as regards testing for infectious diseases. The Agency should provide incentives to increase the participation of provincial public health laboratories in national programs. It should support provincial/territorial public health laboratories in the creation of provincial laboratory networks equivalent to the Canadian Public Health Laboratory Network; these would connect in turn to the national network. The relevant monies would flow from the Communicable Disease Control Fund.**

6.6 **The Canadian Agency for Public Health should support participation and leadership in international laboratory networks by our national laboratories, thereby building on the success of the international collaboration in the response to SARS.**

6.7 **Health Canada, in collaboration with provincial/territorial authorities, should sponsor a process that will lead to a shared vision for the development, incorporation, and evaluation of leading-edge technology in the public health laboratory system. Among the issues that require elucidation are the role of national systems for the real-time surveillance of infectious disease through molecular fingerprinting of microorganisms, toxicology capacity to detect illnesses caused by the poisoning of natural environments and occupational hazards, and the potential for linking genetic testing and infectious disease surveillance in novel programs that would target cofactors associated with the development of chronic diseases.**

6.8 **A national report card of performance and gap assessment for public health laboratories should be developed through the Canadian Public Health Laboratory Network and/or the F/P/T Network for Communicable Disease Control, allowing comparative profiling of various provincial and national laboratories against international standards.**

The Committee also takes note of human resource shortfalls in the laboratory sphere, as outlined in multiple stakeholder submissions. We discuss human resource matters in Chapter 7.

Appendix 6.1
Canadian Public Health Laboratory Network (CPHLN)

Draft Terms of Reference

1.0 Background

The Canadian Public Health Laboratory Network (CPHLN) was organized in 2001 in an effort by provincial health laboratory directors who recognized a void in interprovincial communication and in communication with the National Microbiology Laboratory following the demise of TAC, and was coincidental to the terrorism of September 11, 2001 and to the subsequent anthrax threats. In addition to addressing concerns regarding increased frequency and potential lethality of bioterrorism agents, the scope of the Network was expanded to include other aspects of public health such as food and water safety in response to water quality problems in Walkerton, Ontario and North Battleford, Saskatchewan. At present, the Network is in the initial stages of its development and is currently determining how best to provide leadership in the development of a proactive network of public health laboratories that will serve to protect the health of Canadians. It is also considering how to positively influence and support the broader Canadian health care renewal initiative. The Network's current mandate is to develop and implement strategies to:

- Coordinate pathogen detection, infectious disease prevention and control;
- Conduct laboratory-based surveillance including the development of early warning systems to monitor and detect emerging pathogens, antibiotic resistant organisms and outbreaks; and
- Counter bioterrorist threats.

The benefits envisioned by the CPHLN include:

- A coordinated national laboratory response network;
- National standardization of laboratory procedures and quality assurance methods leading to greater consistency of results;

- Expanded training available to Network participants regarding protocols, best practices and emerging technologies;
- Enhanced national capability regarding the detection of emerging pathogens, antibiotic resistant organisms and outbreaks, and the prevention and control of infectious diseases;
- Reduced duplication of effort; and
- Enhanced support for laboratories through increased collaboration.

2.0 Mission, Vision and Guiding Principles

2.1 The mission of the CPHLN is to provide leadership in public health laboratory functions through the development of a proactive network of public health laboratories to protect the health of Canadians.

2.2 The vision of the CPHLN is to become an action-oriented national microbiology network providing value-added advice and services in direct support of the broader Public Health System.

2.2.1 The CPHLN's guiding principles are:

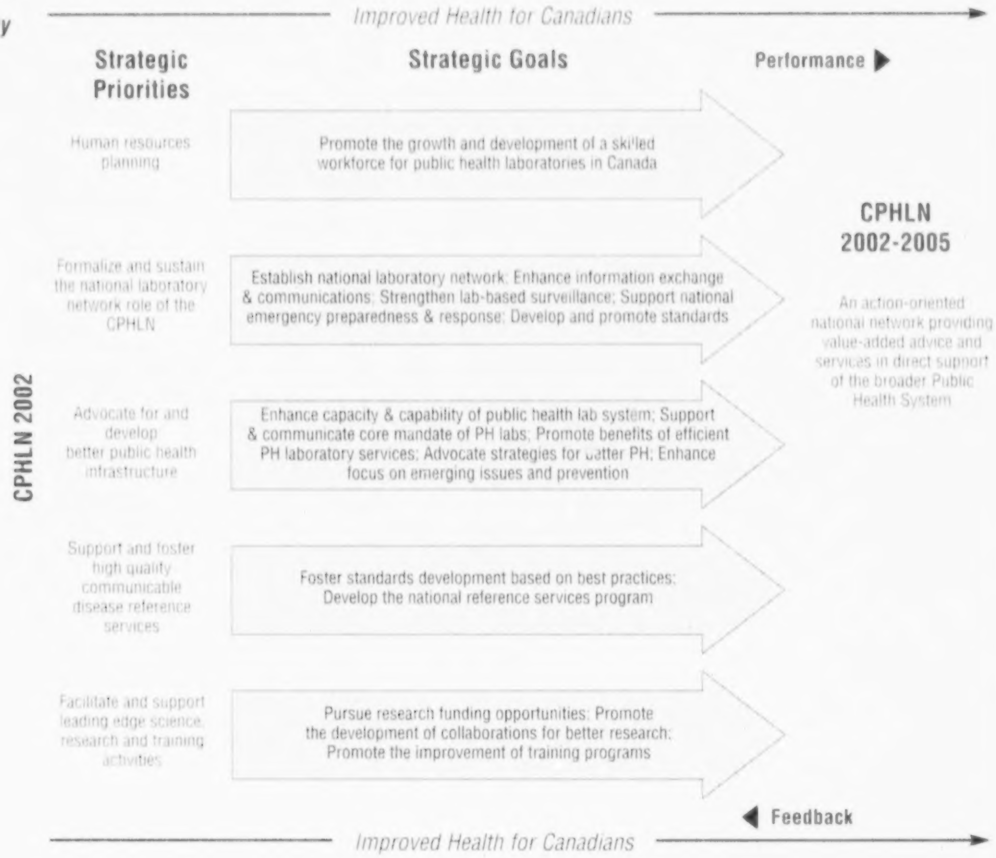
- leadership;
- stewardship;
- partnership;
- integrated management;
- value of public health surveillance and early detection; and
- best practice.

3.0 Strategic Orientation

The following provides a graphical overview of the CPHLN strategic orientation. For more details concerning strategic priorities and strategic goals, refer to the CPHLN Strategic Plan.

FIGURE 1

CPHLN Strategy


Improved Health for Canadians
Strategic Priorities
Strategic Goals
Performance
Human resources planning
Promote the growth and development of a skilled workforce for public health laboratories in Canada
Formalize and sustain the national laboratory network role of the CPHLN
Establish national laboratory network; Enhance information exchange & communications; Strengthen lab-based surveillance; Support national emergency preparedness & response; Develop and promote standards
CPHLN 2002
Advocate for and develop better public health infrastructure
Enhance capacity & capability of public health lab system; Support & communicate core mandate of PH labs; Promote benefits of efficient PH laboratory services; Advocate strategies for better PH; Enhance focus on emerging issues and prevention
Support and foster high quality communicable disease reference services
Foster standards development based on best practices; Develop the national reference services program
Facilitate and support leading edge science, research and training activities
Pursue research funding opportunities; Promote the development of collaborations for better research; Promote the improvement of training programs
CPHLN 2002-2005
An action-oriented national network providing value-added advice and services in direct support of the broader Public Health System
Feedback
Improved Health for Canadians

- Expanded training available to Network participants regarding protocols, best practices and emerging technologies;
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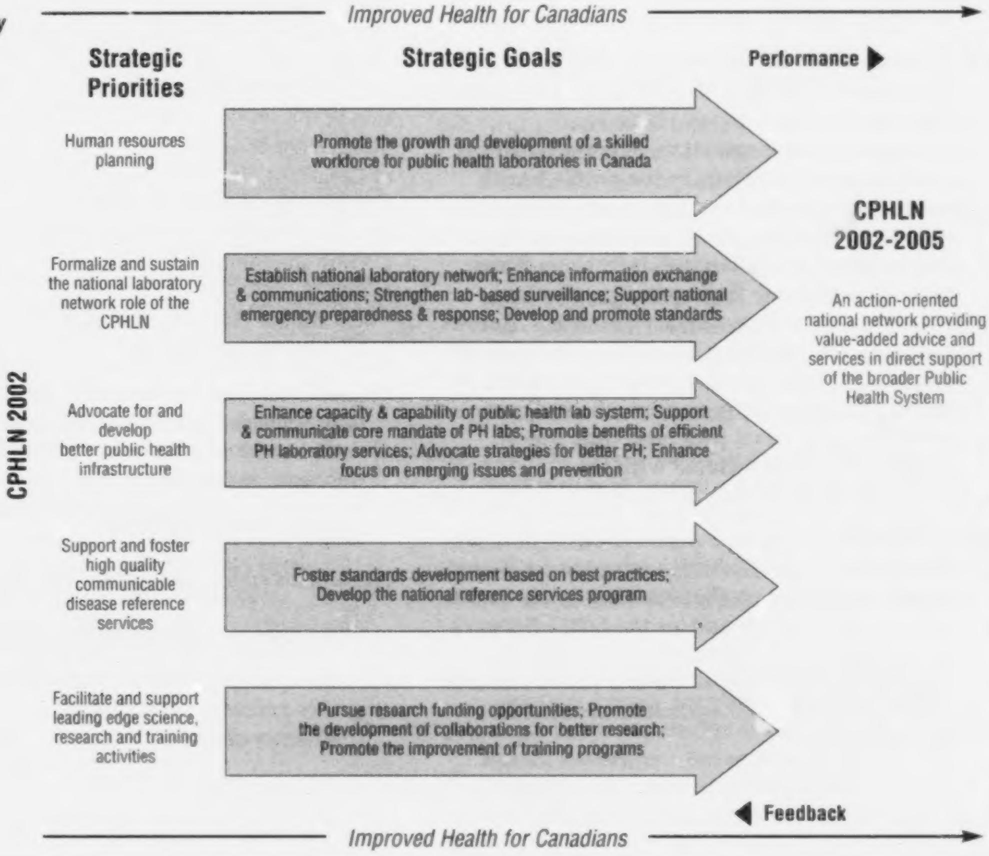
Improved Health for Canadians
Strategic Priorities
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CPHLN 2002-2005
An action-oriented national network providing value-added advice and services in direct support of the broader Public Health System
Feedback
Improved Health for Canadians

4.0 Guidelines/Operating Principles

4.1 The CPHLN shall work within the context of the CPHLN Strategic Plan and reporting structure.

4.2 The CPHLN shall respect the mandates and roles of all partners and work together in a way that will enhance their efforts.

4.3 Where appropriate and feasible the CPHLN shall collaborate with international, federal, provincial, and territorial agencies with a bioterrorism response or public health mandate, and participate on and/or communicate with related committees.

4.4 The CPHLN will facilitate the coordination of existing public health committees by clearly understanding the roles and mandates of the various organizations involved in bio-terrorism response and other public health protection activities.

5.0 Governance

5.1 Membership

5.1.1 The CPHLN shall be composed of no less than 13 and no more than 25 members, including the chairs.

5.1.2 Members shall include the medical or scientific directors from the public health laboratories in each province, except Ontario which lacks a Medical Director for the Ontario Public Health Laboratories and will be allowed two representatives, Health Canada stakeholders, the Department of Defense Research and Development Canada, and the Canadian Council of Chief Medical Officers of Health as follows:

- The Laboratory Director or designate of each Provincial or Territorial Public Health Laboratory (maximum thirteen designates)
- The National Microbiology Laboratory (NML), the Scientific Director General or designate, plus designates from each of the following five NML reference centers: *Bacteriology, Zoonotic Diseases and Special Pathogens, Host Genetics and Prion Diseases, Enteric Pathogens*, and *Viral Diagnostics*). (Six representatives)
- The Department of Defense Research and Development Canada (one representative)
- The Centre for Emergency Preparedness and Response (one representative)
- The Laboratory for Foodborne Zoonosis, Guelph (one representative)
- The Centre for Infectious Disease Prevention and Control, Ottawa (one representative)
- The Canadian Council of Chief Medical Officers of Health (one representative)

5.1.3 Members shall be appointed by their respective organizations for a term of three years. The term is renewable for an additional term of two years at the unanimous discretion of the chair and vice-chair.

5.1.4 In the event that a member resigns during his or her term, a replacement for the balance of the term shall be appointed by the representative organization.

5.1.5 Members shall make a commitment to be actively involved in the work of the CPHLN, to make attendance at meetings a priority and commit to furthering the objectives of the CPHLN as defined by the strategic plan.

5.1.6 Members shall arrange to have a designate to attend meetings in the event that they are unavailable to attend.

5.1.7 Due to the responsibilities of the CPHLN to contribute to the minimization bioterrorism threats to the health and safety of Canadian, all members will be required to have Level II Secret Clearance to maintain membership in the CPHLN.

5.1.8 Any designate who attends a CPHLN meeting in the place of a member must have Level II Secret Clearance.

5.1.9 Outside individuals are not permitted to attend CPHLN meetings except at the invitation of the Chair and with appropriate consideration for security clearance requirements.

5.1.10 Loss of membership can occur by a vote by the CPHLN membership where the consensus of the voting members results in a vote to revoke a particular membership. Reinstatement may occur following a formal written request and a subsequent consensus vote by the CPHLN membership.

5.2 CPHLN Leadership

5.2.1 The CPHLN shall be chaired by one CPHLN member in good standing. The term of the chair is one year. The vice-chair from the previous year will be automatically appointed chair for the following year.

5.2.2 The CPHLN shall have a vice-chair held by one CPHLN member in good standing. CPHLN members shall appoint the vice-chair for a term of one year at which point the vice-chair takes the position of chair for one additional term of one year.

5.2.3 In the event that a chair should resign the vice-chair will assume the position of chair and the CPHLN will appoint a new vice-chair.

5.2.4 In the event that a vice-chair should resign the CPHLN will appoint a new vice-chair.

5.2.5 The chair or, in his/her absence, the vice-chair shall preside over CPHLN meetings.

5.2.6 The chair and vice-chair shall participate as appropriate in the delivery of CPHLN submissions to the Council of Deputy Ministers of Health and/or other jurisdictional bodies with a bioterrorism response or public health mandate.

5.2.7 The chair and vice-chair shall work closely with the Network Manager and, through the Secretariat staff to further the goals and objectives of the CPHLN according to the strategic plan.

5.3 CPHLN Subcommittees

5.3.1 The CPHLN shall create committees and subcommittees as required, to address important public health laboratory issues.

5.3.2 Subcommittee members shall be nominated and approved by the CPHLN for a term of three years (renewable). Where a subcommittee member resigns during that term, a replacement for the balance of the term shall be appointed by the Subcommittee and approved by the CPHLN.

5.3.3 Subcommittee members shall have laboratory expertise in the particular area of focus of the subcommittee and shall represent federal, provincial, territorial or regional laboratories. Subcommittees will attempt representation from each jurisdiction and geographic region.

5.4 CPHLN Secretariat

5.4.1 A dedicated Secretariat shall be established at the NML in Winnipeg, to administer and facilitate the work of the CPHLN.

5.4.2 The Secretariat will consist of a Network Manager and a Scientific Information Officer and Standards Officer who shall report to the Network Manager. Other staff may be hired as required to the Secretariat based on the advice of the Network Manager, endorsement by the CPHLN membership and availability of the required funds.

5.4.3 The Secretariat shall report to the CPHLN chair and be administered on a day-to-day basis by the Scientific Director General of the NML or his/her designate.

5.4.4 The Secretariat shall be funded by Health Canada through the NML until such time as permanent operational funds are established for the CPHLN.

5.4.5 The Secretariat will provide support to and participate in CPHLN meetings as required but will not function as a voting member of the CPHLN.

5.4.6 CPHLN meeting agendas shall be prepared by the Secretariat, in consultation with the chair, and issued at least one week prior to meetings.

5.4.7 Minutes of CPHLN meetings shall be prepared by the Secretariat and distributed to Network members, and other clients and partners as appropriate, within two weeks of the meeting date.

5.5 CPHLN Meetings

5.5.1 The CPHLN shall hold semi-annual meetings to discuss and address business related to strategic priorities, goals, objectives and initiatives; current issues; communication flow; member relations; and funding and resource requirements, including annual budget and operating plans).

5.5.2 Quorum for meetings shall be attendance by a simple majority of members.

5.5.3 Decisions shall be made by consensus where consensus is defined as general agreement, either verbal or by poll. When consensus cannot be reached, decisions shall be made by a simple majority of the members present. Each member receives one vote.

5.5.4 No decision by the CPHLN is legally binding in anyway as the CPHLN is not established as a legal entity.

5.5.5 Minutes will be recorded by the Secretariat and distributed to members.

5.5.6 Agenda items should be forwarded to the Secretariat no later than one month prior to the meeting.

5.5.7 The agenda and required material will be circulated at least one week in advance of the meeting.

6.0 CPHLN Terms of Reference

6.1 Minor amendments to the Terms of Reference may be made by the Chair subject to ratification by the members at the next meeting of the CPHLN.

6.2 The Terms of Reference may be amended at any meeting of the CPHLN by consensus or by vote.

Chapter 7

PUBLIC HEALTH HUMAN RESOURCES

Public health, like other aspects of the health care system, relies on a highly skilled workforce as its most valuable resource. Although sufficient funding and an effective organizational structure are necessary ingredients in a flourishing public health system, the quality of Canada's public health will ultimately rest on the shoulders of its public health workers.

Over the last decade, various task forces and academic reports have usefully addressed issues related to the supply of health professionals and technologists. The focus of most of these studies, however, has been on the human resources necessary for the provision of personal health services. These reports have also served as the basis for intergovernmental agreements; for example, the 2003 First Ministers' Health Accord states that "appropriate planning and management of health human resources is key to ensuring that Canadians have access to the health providers they need... Collaborative strategies are to be undertaken to ... ensure the supply of needed health providers (including nurse practitioners, pharmacists and diagnostic technologists)." The 2003 federal Budget allotted $90 million over five years for health human resources, but no funds were earmarked specifically for the public health workforce.

A shortfall in public health human resource planning and development was recognized in the *Survey of Public Health Capacity in Canada*, a report to the F/P/T Deputy Ministers of Health by the Advisory Committee on Population Health. As we noted in Chapter 3, this report was neither formally endorsed nor taken as a basis for action.

In this chapter, relying partly on the aforementioned *Capacity* report as well as expert opinion, stakeholder input, and existing sectoral surveys, we present a brief assessment of the public health workforce in Canada. The paucity of data on public health human resources, analogous to the limited data on public health spending, illustrates that insufficient attention has been paid to this field.

The Committee took particular note of the very wide range of stakeholders who commented on the challenges of human resources in public health. Among them were the Association of Nursing Directors and Supervisors of Ontario Health Agencies [ANDSOOHA], Canadian Hospital Epidemiology Committee, Canadian Medical Association, Canadian Public Health Association, Canadian Infectious Disease Society, Ontario Hospital Association, National Specialty Society for Community Medicine, Canadian Pharmacists Association, Canadian Association of Medical Microbiologists, Canadian Society for Medical Laboratory Science, Canadian Association of Emergency Physicians, Community and Hospital Infection Control Association of Canada, and front-line nurses and support staff interviewed in focus groups arranged by Health Canada's Office of Nursing Policy.

Some human resource issues raised by stakeholders rest more in the matter of operational and institutional policy, such as the right to refuse dangerous work mentioned in Chapter 9, or pay for time in quarantine. Our focus in this chapter is on the capacity side: Does Canada have enough skilled personnel in various public health fields, and if not, how can the nation close these gaps?

Although the major focus of this chapter is to discuss how human resources issues affect public health functions like health promotion and outbreak management, it seemed salient to recognize the impact the SARS outbreak had on education, and thus the impact future public health crises could have on health human resources. We accordingly begin by describing how the SARS outbreak affected the education of health sciences students. We then present a brief review of information about the supply of public health professionals in Canada. Moving past the numbers, we touch on issues about education and qualifications—are our public health professionals appropriately trained for their work? Finally, we discuss strategies to strengthen the public health workforce and present a set of recommendations.

7A. The Effect of SARS on Professional Education

Post-secondary institutions in Toronto and elsewhere coped with the unprecedented and unanticipated challenges posed by the SARS outbreak. Exams proceeded as scheduled, and no student lost a year or had their program prolonged due to SARS. Nevertheless, clinical training programs for various disciplines were seriously interrupted in Toronto as administrators were forced to devise and then amend policies on an *ad hoc* basis. Nursing students and educators in focus groups described the challenge of searching for timely and reliable information, and the need for a better communications strategy in future outbreaks. Hundreds of students and teaching staff, especially those situated in hospitals, had to deal with uncertainty and stress. A number of medical students and resident physicians were quarantined during the outbreak. One medical student developed SARS but recovered rapidly. In addition to interfering with clinical education, SARS disrupted work at hospital-based research institutes and the progress of graduate students in those environments.

SARS had perhaps its largest impact on continuing education for qualified health professionals and health researchers. A dramatic bellwether was the cancellation on two days notice of a long-anticipated meeting of the American Association for Cancer Research in Toronto. There were 16,000 registrants and local organizers had worked for years on the event. Similar cancellations affected scores of other health education and research meetings, as part of the general decimation of the convention and conference business in the GTA.

Issues also arose with local meetings because of increased risks inherent when health professionals from different institutions congregate. This response was rooted less in personal fears of SARS itself, but rather a broader concern that one infected individual attending a continuing education event could force all other attendees into quarantine. For example, when all of Toronto's cardiac surgeons and others from across Canada met for a day of continuing education during the second wave of the SARS outbreak, attendees worried that a catastrophic disruption in cardiac surgery services would occur if just one attendee were infected with SARS and others were forced into quarantine. The outbreak unquestionably lent new momentum to the use of distance-based educational methods for health professionals.

Most resident physicians (i.e., doctors completing their specialty training) continued their usual work, albeit with restrictions on inter-hospital movement. Although many felt understandably anxious about having to resuscitate or intubate a SARS patient, the vast majority of residents viewed themselves as integral members of the health care team, and willingly volunteered to care for SARS patients. Nevertheless, clinical teachers generally sought to limit the exposure of resident physicians to SARS and took the position that residents should be kept off primary SARS unit duty. Educators and ethicists would be well advised to discuss the role of health professional students and trainees in confronting risks posed by dangerous infectious diseases, and frame guidelines for the next outbreak of SARS or a similar organism.

In the end, SARS had only a minimal negative impact on the education of the next generation of nurses, doctors and other health professionals. Some of its impacts were presumed to be positive, as health professionals-in-training saw firsthand the importance of public health and clinical infection control. However, the potential impact of a public health crisis on the health human resource pipeline is obvious. Training institutions should heed SARS as a warning and better prepare themselves for future disruptions. This includes developing emergency plans in collaboration with health care facilities that offer clinical teaching and with local public health units.

7B. Current Supply of Public Health Professionals

Our assessment of the state of public health human resources in Canada is limited by sparse data. For example, public health human resources have not been well characterized in either the Canadian Medical Association or the Canadian Institute for Health Information [CIHI] databases. Sectoral studies sponsored by Human Resources Development Canada have not focused on public health. Other interested parties, including the F/P/T Advisory Committee on Population Health, have also concluded that there is little quantitative information on the state of public health human resources in Canada.

7B.1 Public Health Physicians

The number of doctors engaged in the practice of public health in Canada is difficult to quantify. Canada has about 400 community medicine specialists (physicians who have completed a course of post-graduate education, passed examinations, and maintain professional competence according to Royal College of Physicians and

Surgeons of Canada standards), as well as an unknown number of physicians with other relevant public health qualifications (e.g., a master's degree, a diploma, etc.).

Approximately 135 local or regional health departments employ a total of roughly 150 medical officers of health [MOH] and associate medical officers of health [AMOH]. Governments also employ some of these physicians directly. Table 1 shows medical officer of health positions based on a recent survey of Chief Medical Officers of Health across Canada. Simple math indicates that a large number of doctors have been trained in community medicine or public health but are not actively working in the public health sphere—including academics, those practising occupational or international health, those engaged in clinical practice, and retirees.

TABLE 1

Public health physicians employed in provincial or municipal positions in Canada.

Province/ Territory	Ministry-employed	MOH	AMOH	Population[1]
NF	1	6	0	531,145
PEI	1	0	0	140,412
NS	2	4	1	944,456
NB	1	5	0	756,368
QC	5	35	0	7,467,626
ON	11	37	11	12,109,514
MB	2	15	1	1,150,564
SK	2	10	3	1,009,225
AB	2	9	5	3,134,286
BC[2]	8	22	6	4,155,779
NU	2	0	0	28,955
YK	1	0	0	29,841
NWT	2	0	0	41,389
Total	**40**	**143**	**27**	**31,499,560**

1. Population figures based on Statistics Canada preliminary post-census estimates for 1996.
2. Data for British Columbia include 6 MOHs at the British Columbia Centre for Disease Control.

Vacancy data are not particularly reliable because physicians working part-time or without formal qualifications occupy many of the filled positions. The National Specialty Society for Community Medicine points out that 8 of 37 health units in Ontario do not currently employ a full-time medical officer of health. The need for additional public health physicians is most acute in rural areas, the Atlantic provinces, the territories and areas served by Health Canada's First Nations and Inuit Health Branch [FNIHB]. Because of human resource constraints, some Canadian provinces simply cannot require that medical officers of health have formal public health qualifications. In Ontario, where specific requirements have been legislated, many health units are forced to rely on acting medical officers of health, who can be hired without the full set of formal qualifications required of medical officers of health.

The Committee intends no criticism of those physicians without full specialist credentials now working as medical officers of health. These individuals are bulwarks of a strained system. Instead, we wish to highlight that Canada faces a shortage of public health specialist physicians with contemporary qualifications.

Objective information on the age of the medical officer of health workforce is currently being collected; preliminary results show that up to 31% of public health physicians in MOH positions will retire in the next 10 years.

The educational pipeline currently has limited capacity. The usual route to public health specialization for a doctor is five years of training after medical school. However, Canada has only 11 residency positions each year for community medicine training. In 2003, only 7 spots were offered in a pool for graduating medical students outside Quebec.

Even more important than the limited number of training spots is the proportion of community medicine residents who actually work in public health after completing their specialty training. This is variously described by the three largest programs as "most", "very few", and "about half". Only a handful of Canadian-trained physicians, therefore, enter the public health workforce each year. A few more public health physicians are recruited from countries like the United Kingdom and South Africa each year but overall, the supply pipeline remains extremely constrained. Preliminary survey results show that 83% of public health physicians believe that there should be more residency positions, and 87% support easier re-entry into post-graduate training for doctors already practising family medicine or another specialty.

Compensation is frequently cited as a barrier to recruitment and retention of public health physicians. Whether compensation-related or not, interest in the specialty is limited.

In Quebec, public health physicians are able to bill the provincial health insurance program on a sessional basis instead of receiving a salary from the public health department. This arrangement, along with a provincial strategy of self-sufficiency in health human resources, has given Quebec many more physicians working in public health departments than elsewhere in the country—more than 140 specialists are registered with the Quebec Association of Community Health Physician Specialists.

Relatively poor remuneration is not the only drawback to working as a public health physician. Other potential disincentives are the challenges of working in a political and bureaucratic environment and bearing ultimate responsibility for the health of thousands of citizens in a particular region.

7B.2 Public Health Nurses[1]

Public health nurses are the single largest group of professionals in the public health workforce. By most estimates they account for almost one-third of the total public health human resources. Experts estimate that there are approximately 12,000 public health nurses in Canada. (CIHI reports 21,334 in 2002, but this figure includes nurses working in community health centres, day care centres, and several other settings).

The Canadian Nurses Association has noted that the number of registered nurses in Canada rose from 113,000 in 1966 to 262,000 in 1991, but was only 253,000 in 2001. The Canadian Nurses Association estimates that Canada will be short 7,000 registered nurses by 2011 and 113,000 by 2016. Some experts suggest that Canada is already short 16,000 nurses. Unfortunately, information about the nursing workforce is not collected in a way that makes it possible to extract data on public health nurses.

Shortages are reported in rural, remote and First Nations locations. For example, about 50% of FNIHB's nursing positions were reported to be unfilled two years ago. Overall, our best estimate is that the shortage of nurses for public health positions is similar to that for other nursing specialties. Some would argue that the situation might actually be better in public health. The hours and nature of the work and the relative independence in decision making make these positions attractive choices for many nurses. To quote one interview participant, "It's easy to find applicants to recruit, especially with nurses wanting to leave the poor conditions of acute care, and move to Monday to Friday schedules." On the other hand, Committee informants reported that nurses are demoralized by a mismatch between funding and service demands. One public health nurse observed that: "There is an increased expectation to do more with less. This expectation is becoming increasingly unmanageable."

Nursing recruitment into public health is particularly difficult in rural and remote northern areas. Remote northern areas have the unique challenge of extreme social isolation, although turnover in rural and northern areas is reportedly low. Remote areas that have retained experienced public health nurses for long periods now face the challenges associated with an aging workforce. Nurses new to the north need opportunities to develop the breadth of skills and depth of knowledge needed to practice independently. Funds and mechanisms for continuing education are therefore an important part of retention and career development for public health nurses in remote areas.

In some jurisdictions, the restructuring of health systems has resulted in the integration of public health staff and budgets with those for patient care. Integration may also include one collective agreement for all nurses employed by the regional authority. This has contributed to identity loss for public health nurses. As one individual told the Committee, "A frustrating by-product of regionalization is that public health nursing has no central leadership, no one to address broad public health nursing mandates."

A related problem is the reintroduction of "integrated practice" or "community health nursing", where the distinction between traditional public health nursing and individual care is blurred. Where a nurse is responsible not only for community health promotion, but also for home care or ambulatory clinic care, limited public health resources may end up diverted into other areas of the health care system.

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[1] Information for this section was obtained by Health Canada through 13 key informant interviews, 20 survey responses (from a convenience sample), and a non-exhaustive literature review. Interviews and surveys reflected input from British Columbia, Alberta, Saskatchewan, Ontario, Nova Scotia and Newfoundland and Labrador. Urban, rural and remote perspectives were captured. Respondents included public health nurses, administrators, educators, and consultants.

The crucial work that public health nurses perform is sometimes invisible. The submission by the ANDSOOHA spoke eloquently to the essential role of public health nurses during the SARS outbreak, but these contributions have received little public attention. Indeed, the Committee heard repeatedly that public health nurses feel that governments, the public, other health professionals, and perhaps most discouragingly, nurses in other sectors are insufficiently aware of the contribution of the public health nurse.

Public health employers currently use a wide variety of recruitment and retention strategies to entice nurses into public health practice. In addition to better compensation packages, employers use recruitment strategies such as offering funds for continuing education, advertising campaigns, establishing wellness projects designed to enhance the work environment, and implementing monitoring tools like exit interviews. In some cases, however, recruitment strategies themselves have been compromised by budget cuts.

7B.3 Laboratory Personnel

Working behind the front lines, laboratory personnel are essential members of the public health workforce as the preceding chapter indicated.

Medical microbiologists are in very high demand. As with community medicine, there are few residency positions for MD-prepared medical microbiologists, and available spots often go unfilled. PhD-trained microbiologists are also in short supply, and the erosion of public health laboratories has limited the attractiveness of this career stream. Even were the applicant pool large enough to replace those who retire—and most expert informants believe that it is not—newly-qualified persons rarely have the additional skills essential (e.g., epidemiology and management training) for public health work. Unlike the United States, Canada has no formalized post-doctoral program providing for medical microbiologists interested in a public health career.

The alignment of responsibilities and salary remains an issue. The Canadian Association of Medical Microbiologists commented on "the lack of competitive financial remuneration in the public health sector." For example, in August 2003, the Committee noted that a provincial government was advertising for a laboratory specialist to manage a regional public health laboratory. The advertisement sought applicants with a knowledge of bacteriology, virology, mycology, parasitology and serology who had an MSc or PhD from a university of "recognized standing", demonstrated managerial experience, highly developed interpersonal skills, and a willingness to travel. The salary range was $60,000 to $77,000.

PhD-trained microbiologists are critically important in staffing reference laboratories and research centres. The Committee did not have a detailed inventory of training opportunities and output of research scientists who have the capacity to play a role in cutting-edge laboratory activities that will lead to better diagnostic and therapeutic capacity for emerging infectious diseases. However, we are concerned that these highly-skilled personnel are not being trained, recruited, and retained in sufficient numbers.

Aside from the recurring theme of rural undersupply, the supply of technologists is more or less adequate at present. However, this is partly a function of recent trends to mechanization and centralization of laboratory functions, but these trends have reduced the number of full-time positions and may have ripple effects on longer-term labour supply. The Canadian Society for Medical Laboratory Science [CSMLS] notes that "Half of Canada's medical laboratory technologists will be eligible to retire by 2016...Thirty per cent of medical laboratory technologists work part time. The number of part-time positions reflects the cutbacks in laboratory staff that have taken place in institutional workplaces, which in turn have an impact on the ability to recruit new people into the field." CSMLS estimates that 281 new training positions are required based on current demands and demographics in their discipline.

7B.4 Infection Control Practitioners and Hospital Epidemiologists

Infection control practitioners—The US recommendation for the provision of trained hospital infection control practitioners [ICP] is one per 250 active care beds. More recently, the Infection Control Alliance (an alliance between the Canadian Infectious Disease Society, the Community and Hospital Infection Control Association and Health Canada) has recommended a ratio of one ICP per 175 active care beds. Forty-two percent of Canadian hospitals fail to meet the former standard, and 80% cannot attain the latter. Health Canada has been considering even more stringent standards; these envisage one practitioner per 115 acute beds, and one per 250 long-term beds. These ratios would drop further for institutions with critical care beds. Given our hospitals' inability to meet the current standard, it is obvious that they will be unable to come close to the new Health Canada standard. This suggests a massive shortfall in the number of infection control practitioners necessary to provide optimum infection control in the hospital sector.

Infection control practitioners are mostly either nurses (88%) or laboratory technologists (10%) who learn on the job. Fifty-five percent are certified—usually by the Certification Board of Infection Control and Epidemiology in the United States. Certification requires two years' experience, learning from a self-study guide and passing an examination. Continuing education is required to maintain certification.

Health Canada was formerly involved in infection control training; a senior Health Canada nurse led modular training courses for practitioners across the country. These courses were well received, but Health Canada has neither offered nor been directly involved in infection control training courses since 1989. There is now one formal training program in Canada—the Canadian Hospital Infection Control Association and Centennial College partner to train infection control practitioners in an intensive two-week course.

Hospital epidemiologists—Some physicians, usually trained in infectious disease, spend part or all of their time as medical directors of infection control programs. These individuals are known as "hospital epidemiologists" in the USA, although few have full training in epidemiology. Only one Canadian university, the University of Calgary, currently offers post-graduate training in hospital epidemiology. The number of fully-trained hospital epidemiologists in Canada is extremely limited, and most of them received their education in the United States. Many physicians working as infection control directors lack this background. The advantage of hospital epidemiology training is that it helps to create a conjoint public health and infection control approach.

Fewer than 60% of Canadian hospitals have a physician serving as infection control director. Those who fill these roles sometimes lack formal training, and others with infection control or hospital epidemiology backgrounds are spread across multiple institutions. The reason for this undersupply is clear—infection control activity does not count as 'billable time' for physicians, and hospitals are understandably reluctant to divert scarce resources into unfunded programs.

Surge capacity—Severe understaffing of Toronto-area hospitals from an infection control standpoint became clear during the SARS outbreak. As noted in Chapter 2, even if the government had ordered hospitals to conduct comprehensive syndromic surveillance after the first wave of SARS cases, most hospitals would not have been able to operate such a program without outside help. During outbreaks, when multiple institutions are affected simultaneously, the problems inherent in sharing infection control practitioners and directors among institutions also become apparent.

Integration between hospitals and public health units—Outbreaks obviously do not confine themselves to hospitals. Therefore, formal linkages between hospital infection control programs and public health units are important. In Ontario, for example, mandatory guidelines require that an employee of the local public health unit sit on each hospital infection control committee. Informal contacts are common, but as we shall see in Chapter 8, compliance with guidelines is variable.

7B.5 Infectious Disease Specialists

Infectious disease specialists are physicians certified in internal medicine or paediatrics who have taken additional sub-specialty training in infectious disease. Most infectious disease physicians choose to work at academic rather than community hospitals. Committee interviewees speculated the preference for teaching hospitals might be related to compensation. It is not uncommon for these specialists in teaching hospitals to be supported by a variety of salary sources to maintain a competitive income, given the relatively limited potential for generating fee-for-service revenue through patient care. In community hospitals, infectious disease physicians are not able to bill as much as other specialists. More generally, infectious disease specialists face the same income gap as other cognition-based medical specialties when contrasted with procedurally-oriented specialties.

The continued challenges of older and emerging infectious diseases, including the appearance of more antibiotic-resistant organisms, has led more community hospitals to search out infectious disease specialists. In the Greater Toronto Area, for example, there are now 12 community-based specialists in infectious diseases as contrasted with two a decade ago. However, this remains a specialty that is undersubscribed and inconsistently supported by conventional fee-for-service billings.

7B.6 Epidemiologists

Committee informants were virtually unanimous in their belief that Canada needs more epidemiologists who can do outbreak investigation and infectious disease research. While Canada does train a modest number of epidemiologists, they are drawn largely into non-communicable disease epidemiology, including cancer and cardiovascular disease, as well as health services research where their observational and analytical skills are both valuable and valued. A prominent exception is HIV/AIDS; many highly-trained epidemiologists are working on controlling this disease. Canada must draw more students into the field of infectious disease epidemiology and provide support and training opportunities for them. It has also been argued that short courses in infectious disease epidemiology are an essential part of capacity building for many aspects of public health practice and leadership, but are not widely available.

7B.7 Other Public Health Workers

Many other disciplines do work that is relevant to public health. Examples include public health inspectors, dental hygienists, nutritionists, health promotion specialists, communication officers, sociologists, and community development workers to name a few. Little or no information is available on the number, trends, and challenges facing these groups, emphasizing the need for a comprehensive inventory of the public health workforce. In disciplines such as pharmacy and veterinary medicine, there is more reliable information on the workforce but, as indicated in submissions by national associations for both these professions, insufficient attention has been paid to how their work could be integrated with public health priorities.

7B.8 Overall Assessment

Although data are scarce, the SARS outbreak made clear that even in Toronto, where the public health infrastructure is relatively strong, public health human resources are deficient. Indeed, one of the rate-limiting steps in the Committee's plan to enhance Canada's public health infrastructure is the lack of qualified personnel to take on the relevant roles and responsibilities. Several provincial and territorial ministries have vacancies in key positions. Although urban centres are currently able to fill most of their public health positions, problems with recruiting and retaining public health physicians were reported in all jurisdictions and public health nurses are in particularly short supply in rural and northern areas. Anecdotal reports suggest that the situation with public health inspectors is only marginally better, and infection control practitioners are in critically short supply given the new standards about to be released. Infectious disease epidemiologists are few and far between, and Canada also lacks medical microbiologists and fully-qualified directors of hospital infection control. Existing human resources, in sum, are insufficient to meet current and future public health challenges.

7C. Nature of Education and Training

Although Canada needs more public health workers, increasing the supply alone would be a half-measure. A thorough review of public health training programs is also needed—new entrants to the public health workforce should be appropriately qualified, and existing public health workers should be provided with opportunities to acquire additional skills if necessary. We focus here on just three of the groups reviewed above—physicians, nurses, and epidemiologists.

7C.1 Physicians

Although we produce far too few public health physicians, the ones who do undergo specialty training are well qualified. Unlike in the United States and the United Kingdom, all residency programs in Canada must be university-based. The Royal College of Physicians and Surgeons of Canada closely monitors all specialty residency programs, ensuring uniformly high standards across the country. According to the National Specialty Society for Community Medicine [NSSCM], all nine fully-accredited training programs for public health specialization offer relevant didactic training plus supervised field-based experience in responding to communicable disease outbreaks.

On the other hand, the nature of this outbreak experience clearly varies. At least part of the problem in combating SARS was that the generation of public health physicians who had faced massive outbreaks of life-threatening respiratory or enteric viruses is no longer practising. An outbreak of an enterovirus like Norwalk has a significant effect on the health care system but does not threaten lives the way that SARS did. HIV has its own relatively distinct epidemiology. West Nile virus is not transmitted from person to person, and tuberculosis is rare. The generation of public health physicians who fought outbreaks of polio has long since retired. The public health physicians and hospital epidemiologists who fought SARS have a unique experience that is shared only by some who have fought outbreaks through international outreach and training. Their experiences should be distilled and shared widely.

Exposure of public health physicians to hospital infection control issues varies with the site of their training and early practice experiences. The NSSCM highlighted that regional health authorities have offered an opportunity for more seamless integration of the public health and clinical perspectives. Many regions have a Communicable Disease Advisory Committee that includes representatives with expertise in broad public health, hospital and long-term care infection control, epidemiology, and surveillance.

Relatively few public health physicians maintain active clinical practices while working for a public health unit. Aside from reporting mandatory diseases, even fewer clinical specialists and family doctors interact in a meaningful way with their local public health units. Opinions presented to the Committee varied as to the merits and nature of "cross-training". Some endorsed the idea of dual training in general internal medicine and community medicine. Others pointed out that specialists in community medicine have ample clinical exposure during their post-graduate training, including full certification in family medicine. The NSSCM suggested that cross-training would be best constructed by focusing not on public health specialists but on clinicians, viz. requiring family medicine, emergency medicine, general pediatrics and internal medicine, and infectious disease residents "to complete at least a one-month rotation in communicable disease control in a local public health unit."

The *Survey of Public Health Capacity* in Canada found a widespread belief that continuing education opportunities are lacking for public health practitioners. About half of respondents reported that continuing education to be somewhat or completely inadequate. Greater continuing education opportunities are especially needed in the areas of informatics and technology.

Limited linkages to academe add to the problems with recruitment and retention of public health practitioners in urban areas. Among the various medical specialties, community medicine provides perhaps the fewest opportunities for active practitioners to form a working relationship with a university. Some community health practitioners hold unpaid adjunct appointments, but there are only a few instances where public health physicians engage in both academic work and public health practice. Community medicine specialists who work entirely within the university sector are also becoming rare. As Prof. Harvey Skinner, chair of public health sciences at the University of Toronto has written, strengthened linkages between the academe and the public health sector "advance an evidence-based culture of learning, stimulate interdisciplinary research and knowledge translation, [and] accelerate basic and advanced training."

7C.2 Nursing

Traditionally, registered nurses had to complete an additional one-year diploma before becoming a public health nurse. Nursing degrees are now becoming the norm, and diplomas have been discontinued. Most public health nurses today are baccalaureate-trained, and further specific training in public health is no longer mandatory. Instead, public health nurses learn on the job through formal and informal in-service training.

Some experts believe that specific public health nursing training should be reintroduced. Public health nurses have expressed the view that public health nursing should be regarded as an advanced practice specialty. Acceptance of this position has apparently been hampered by the unavailability of graduate programs in public health nursing. When nurses with longstanding experience in the clinical sector move to public health posts, formal retraining is appropriate, but the formal training and retraining opportunities in public health are limited. Relatively few registered nurses go on to a master's degree in public health or similar graduate credential, and career paths in public health nursing have not been well-defined.

Some respondents also suggested that the educational system could better equip nursing graduates for public health practice. The undergraduate nursing curriculum tends to focus on acute care; population and public health courses are limited. In addition to ensuring adequate credit hours for public health theory and practice, training institutions need to hire faculty members with public health expertise.

Many faculties/schools of nursing would benefit from closer collaboration with public health units to provide meaningful practicum experiences for nursing students. Some Committee informants remarked that curricula should be more collaborative—public health nurses work in interdisciplinary teams, and they should train in an interdisciplinary environment as well.

As already suggested, opportunities for upgrading knowledge in public health nursing are limited. Some employers fund continuing education; few fund it satisfactorily and some do not fund it at all. Some Committee informants reported workplace policies supportive of continuing education; others described an environment with rigid schedules (compromising the ability to attend courses), a complete lack of tuition fee support, and an unwillingness or inability among supervisors to provide the on-site practical experience necessary for certain qualifications. Unique challenges were identified in northern, rural and remote settings where in-person continuing education is prohibitively expensive. Keeping rural public health nurses energized by contemporary best practices is nearly impossible with the current communications infrastructure.

National standards for public health nursing practice would be helpful in establishing a set of core competencies in the public health nursing workforce. They must be implemented carefully to avoid compromising an already limited workforce by erecting new barriers to entry. The necessary core competencies suggested by Committee interviewees include an understanding of:

- population health principles
- epidemiology and surveillance
- basic statistics
- environmental health
- informatics and data management
- program planning, management and evaluation
- adult education
- advocacy
- negotiation
- interdisciplinary practice
- injury prevention
- health promotion
- community development
- social marketing
- public policy and legislation
- research methodology and statistics

7C.3 Epidemiologists

It was abundantly clear during the SARS outbreak that Canada needs more epidemiologists with an orientation to field investigation and outbreak response. Canada has many university epidemiology programs, but most of these are research-oriented. One exception is the University of Toronto's Master of Health Science program—its content is relevant to public health, and many of its enrolees are practising health professionals looking to upgrade their skills. However, the program constitutes a broad preparation for a career in public health and does not offer the depth or experience required for outbreak investigation. Furthermore, PhD-stream epidemiologists seem to be drawn largely to non-communicable diseases, HIV/AIDS, and health services research.

One non-university option is the Field Epidemiology Training Program operated by Health Canada. This program takes in just five or six individuals per year (mainly health professionals who already have a master's degree in epidemiology), provides further training and then assigns them to supervisors in the field. Under supervision, the trainees usually have the opportunity to investigate outbreaks. The result has been a small but growing cadre of field epidemiologists who are better prepared for leadership positions in local, provincial or national public health agencies.

The program has tremendous potential. US experience with a similar program illustrates the many advantages of a dynamic field-epidemiology training program in creating cross-linkages among jurisdictions and strong expertise in outbreak investigation and response, including issues of institutional infection control. We believe the field epidemiology program should be reviewed and greatly augmented as part of a broad F/P/T strategy for renewal of human resources in public health. The proposed F/P/T Network for Communicable Disease Control, and a National Public Health Service within the Canadian Agency for Public Health would provide training opportunities and a career path for those enrolled in this program.

Health Canada's Skills Enhancement for Health Surveillance program is a web-based distance education program aimed at front-line and supervisory workers in local health departments. While not intended to substitute for master's level training, and still under development, it aims to provide basic, high-quality training in epidemiology, surveillance and information management.

7D. A Public Health Human Resources Strategy

No attempt to improve public health will succeed that does not recognize the fundamental importance of providing and maintaining in every local health agency across Canada an adequate staff of highly skilled and motivated public health professionals. Our national aim should be to produce a cadre of outstanding public health professionals who are adequately qualified and compensated, and who have clear roles, responsibilities and career paths. Without urgent implementation of a public health human resources strategy, that aim cannot be achieved.

Other nations are also grappling with this challenge. In the USA, partly as a result of a fragmentation of public health services at the local level, skills and qualifications are suboptimal. A CDC report published in 2000 reported that only 44% of the public health workforce had formal training in public health and just 22% of local health department executives had graduate degrees in public health. Despite (or perhaps because of) these discouraging statistics, the USA and several other countries we reviewed have specific initiatives directed towards developing and sustaining the public health workforce. For example, joint initiatives between the CDC and post-graduate schools of public health target the continuing education needs of the United States public health workforce.

We have highlighted already that Canada faces a serious shortage of public health physicians. However, simply creating more training positions will not suffice. Incentives are needed that will draw medical students into community medicine as a specialty training program. In turn, given the clear problem with graduates who leave the field, there is a need to provide community medicine graduates with more rewarding careers in public health per se. Some small rural regions with few resources will continue to find it difficult to attract qualified medical officers of health; it may be necessary to combine health regions for public health purposes, or to have a two-tier system of medical officers of health, with senior staff acting as consultants or supervisors to several regions.

Medical officers of health and senior public health nurses also need better linkages with universities. Most physicians practising at teaching hospitals receive university appointments—in addition to treating patients, they teach medical students and resident physicians, and are often supported to do research. In the public health sphere, the teaching health unit is the teaching hospital equivalent. This valuable concept should be embraced in every city where the 16 Canadian health science faculties are located. "Teaching health units" are critical if public health is to attract its share of exceptionally able physicians, nurses, epidemiologists, social scientists, and other public health workers. Analogously, in fields such as medical microbiology, both Health Canada's laboratories and the British Columbia Centre for Disease Control have demonstrated that close links with university departments are beneficial. These academic connections feed a cycle of training and research opportunities that help to make knowledge-based workforces self-renewing and dynamic.

The available data suggest that shortages and challenges from insufficient training and suboptimal work environments affect many constituents of the public health workforce. A national initiative to frame a public health strategy is clearly needed. Part of the exercise must be to hear out the concerns of public health practitioners in all the relevant disciplines. Any national strategy for renewal of human resources in public health can only succeed if developed in consultation with a broad range of stakeholders and supported by a dedicated national secretariat. Moreover, a plan on its own will do nothing—it must attract resources and be put into action as a matter of urgency. This is why, in budgeting for the Canadian Agency for Public Health, the Committee projected a recurring expenditure of $25 million per annum for health human resource renewal.

Training, professional development and continuing education will be prominent activities in reconfiguring the public health workforce. Existing programs can be bolstered. The Field Epidemiology Training Program, for example, should be significantly expanded beyond its current intake of five or six trainees each year.

As outlined in earlier chapters, the Committee envisages a system of federally-funded training placements that would constitute a logical career path for young Canadians interested in public health. A public health nurse fresh from his baccalaureate could take a part-time Master's degree in Public Health with a tuition bursary while doing disease surveillance projects in one of the regional nodes on the F/P/T Network for Communicable Disease Control. He could then spend a year doing front-line general public health work in an Aboriginal community and return to a health promotion position in Vancouver's public health department. A physician trained in community medicine could do a Field Epidemiology Placement, learning the essentials of outbreak management as part of a mobile response team based in Winnipeg. She could go on to become an Associate

Medical Officer in Toronto, then rejoin the federal system as the director of a non-communicable disease surveillance program in the Canadian Agency for Public Health. Internet-based distance education could be used more extensively. All of these activities would be undertaken with academic, voluntary sector, professional and international partners, linked to and by a series of formal and informal networks, and set out in a multi-year plan with milestones and measurement of progress.

Public health workers, like other Canadians in the workforce, want and need stimulating career paths. A National Public Health Service, where interested individuals could move through medium-term assignments in different disciplines or locations, would build capacity by strengthening individual skills and by sharing knowledge across jurisdictions. This movement of personnel would assist with disease surveillance and coordination of health promotion. A wider range of pan-Canadian experiences for public health leaders would also facilitate sharing of experiences with new programs and systems. Canada's F/P/T health systems are pluralistic and innovative; better learning across the systems would save costs, boost morale, and build collaboration. Last, in emergencies, a cadre of individuals familiar with change and accustomed to steep learning curves would be ready for deployment to municipal and provincial public health agencies.

The Committee did review several options for improving our public health human resources. The ***status quo*** is clearly insufficient—the public health human resources situation would continue to deteriorate, leaving Canadians vulnerable to a wide range of infectious diseases in the future, and subject to preventable morbidity and mortality from chronic diseases and injuries. A strategy to increase the number of public health workers by ***lowering standards*** was briefly considered. When properly qualified persons are unavailable, one could, in theory rely upon untrained persons. The Committee believes this would lead to a "race to the bottom", would negate gains made over several decades of gradual improvement in standards, and increase the risk to the public's health. Notwithstanding these concerns, there may be valid reasons to examine critically some of the competencies and qualifications required for effective public health practice. The public has a right to know that their tax dollars are flowing to support the most cost-effective approach to provision of services.

In an ***incremental/disjointed*** strategy, each F/P/T jurisdiction might attempt to address issues as they arise. Education and recruitment issues, however, as well as the inter-jurisdictional nature of public health practices, necessitate a national approach. The western provinces, for example, cannot currently meet their needs for public health physicians without recruiting from Ontario.

We could also ***recruit our public health workforce from abroad***. While this may be suitable in select instances, relying on foreign recruitment is subject to fluctuations in international supply, arguably unethical when we raid developing countries such as South Africa that have health human resource challenges of their own, and unlikely to meet Canadian needs in the longer-term.

All this leads us back to the view that a coherent ***national strategy*** is the only way forward. A national public health human resources strategy should be based on a partnership (after the Australian model) involving federal, provincial and territorial governments, as well as academic stakeholders and professional associations. Under the guidance of a director and with the support of a secretariat, such a partnership must develop a strategy, implement it, and monitor its progress. The secretariat should work with regulatory bodies, CIHI and other organizations to support data collection, develop better baseline information about the workforce, compare roles of public health workers in Canada and other countries, and evaluate the roles of different members of the public health workforce. The secretariat must also explore why certain professionals choose public health practice and others do not; help define the educational standards needed to achieve, maintain and enhance competence for public health; and make recommendations regarding public health pay scales.

Institutional infection control provides an illustration of how the strategy and secretariat might function. Relevant stakeholders would be pulled together into a task force to address this specific sector. A first phase of activity might see assessment of current standards and training programs, along with a more precise delineation of the supply of infection control practitioners and anticipated shortfalls. The next phase could be the rapid development of strategies to increase training opportunities and offer incentives to nurses, laboratory technologists, and others who might be trained in infection control. These strategies would be rolled out with support from the Canadian Agency for Public Health and provincial/territorial jurisdictions as well as institutional partners. Creation of continuing education and recertification programs could also be part of the strategy for sustaining the ICP workforce. Last, to maintain a cycle of workforce renewal, graduate programs in infection control could be developed in a limited number of universities, thereby training the next generation of teachers of infection control practitioners.

Any national human resource strategy should be closely aligned with other plans to enhance surge capacity. The HERT concept, for example, appears best suited to full-blown emergencies. Might there also be a system of human resource clusters so that redeployment of personnel would be possible in the event of other shortfalls in local or regional response to a particular set of health threats? From the Committee's perspective, any human resource strategy should not only aim at making Canada self-sufficient as regards public health personnel; it should also explicitly aim at enhancing inter-jurisdictional collaboration on a continuing basis. A national strategy could therefore provide for more varied positions, flexible employment, exchanges between different job positions (both within Canada and internationally), and cross-jurisdictional continuing education.

Either through the partnership or through the creation of a virtual national public health institute focused on education and training in public health, dedicated funding mechanisms must be developed to support public health workforce development. The $25 million per annum from the Canadian Agency for Public Health would go some distance to catalyzing workforce renewal. But shared funding will be necessary to create regional consortia and teaching health units, to augment graduate and post-graduate training positions in public health, to increase the presence of actively practicing public health professionals in universities, to support opportunities for advanced training in public health for nurses already in the workforce, and to provide scholarships and bursaries targeted at high-need areas such as First Nations and rural communities.

The strategy will depend, as noted, on more than F/P/T collaboration. Partnerships must be developed with educational institutions, relevant national and provincial associations, regulatory bodies, major municipal health units, industry, research agencies, rural communities, Aboriginal groups, and other stakeholders. Educational institutions, in particular, would need incentives to review curricula in relevant health disciplines to ensure adequate exposure to public health and the control of infectious diseases. A major step forward would be development of an 18-24 month non-thesis applied epidemiology and public health master's degree for health professionals, available in full-time and 'executive/part-time' formats, at multiple sites across Canada. Other foci for new programming include "summer schools" or short courses in epidemiology, outbreak investigation, public health informatics, health promotion, and similar topics relevant to the practice of public health, targeting public health practitioners already in the workforce. We also urge the creation of a one-year public health leadership and management program, and funding of post-doctoral positions in public health laboratory science. Finally, Canadian universities, the Canadian Institutes of Health Research, the new Canadian Agency for Public Health, and other federal agencies and departments, must play an active role in increasing the opportunities for public health workers to develop or strengthen their research skills.

7E. Recommendations

The Committee recommends that:

7.1 Health Canada should engage provincial/territorial departments/ministries of health in immediate discussions around the initiation of a national strategy for the renewal of human resources in public health. This F/P/T strategy should be developed in concert with a wide range of non-governmental partners, and include funding mechanisms to support public health human resource development on a continuing basis.

7.2 Health Canada should catalyze this strategy by urgently exploring opportunities to create and support training positions and programs in various public health-related fields where there are shortfalls in workforces (e.g., community medicine physicians, field epidemiologists, infection control practitioners, public health nursing, and others).

7.3 The Canadian Agency for Public Health should develop a National Public Health Service, with a variety of career paths and opportunities for Canadians interested in public health. The National Public Health Service should include an extensive program of secondments to and from provincial/territorial and local health agencies, with arrangements for mutual recognition of seniority and a range of collaborative opportunities for advancement.

7.4 Educational institutions, in collaboration with teaching hospitals as applicable, should develop contingency plans to limit the adverse impact on their students and trainees from infectious disease outbreaks, while maximizing learning opportunities from these events. These plans should include communications, education regarding infection control, preparedness with appropriate protective gear, guidelines for support of students/trainees in quarantine or work-and-home isolation, strategies to limit the impact of impeded access to usual teaching and research sites, and guidelines for the involvement of students in the care of patients with serious infectious conditions.

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Chapter 8

CLINICAL AND PUBLIC HEALTH SYSTEMS ISSUES ARISING FROM THE OUTBREAK OF SARS IN TORONTO

Throughout its deliberations, the Committee appreciated the importance of understanding the response to SARS within a clinical and local public health context. While we recognize that these matters are primarily a provincial responsibility, viruses do not respect borders or jurisdictions, and lessons from Ontario are almost certainly applicable to other provinces. We have indicated that British Columbia was both fortunate and in some respects better prepared to deal with SARS. We also speculated that had SARS touched down somewhere other than Toronto, the results could have been more devastating, although it is possible that some of the jurisdictional tensions would have been less.

Based on the SARS experience, this chapter discusses the steps that key informants believe might be taken to enhance the readiness, efficiency and effectiveness of the response to a future outbreak. It also provides an assessment of the deferred service and disruption during SARS and actions that might be taken in future to reduce the degree of disruption to 'normal' services.

This chapter draws heavily on work by the Hay Group. The Committee gave a specific mandate to these consultants and interacted with them on study design. Their conclusions were extraordinarily consistent with those that arose from stakeholder submissions and from the Committee's own experiences, interviews, reading, and deliberations.

The consultants used a combination of surveys, interviews, focus groups and data analysis. These activities focused on a sample of organizations and individuals in the public domain significantly affected by SARS and/or who were actively involved in the management of the response. Given the time frame available, the consultants established firm schedules for participation and requested that participants make themselves available. The organizations and individuals contacted made every effort to provide input within the schedule and the Committee greatly appreciates their efforts.

We have dealt elsewhere with the readiness of Health Canada to respond in support of those at the local and provincial levels fighting SARS. Health Canada's responses were seriously confounded and limited by the lack of jurisdictional clarity about roles and responsibilities and the lack of what can be termed 'a receptor function' in the provincial system. However, it should be emphasized here that, during the consultants' work, multiple informants indicated disappointment with the role played by Health Canada in dealing with the outbreak in Toronto.

The chapter also draws strongly on a series of roundtables convened by Health Canada's Office of Nursing Policy to solicit the perspectives of front-line nurses and support staff affected by the SARS outbreak in Toronto. Regulatory colleges, professional bodies, and unions affiliated with these two groups were also invited. Two Committee members attended the sessions.

In framing our perspectives and recommendations, the Committee was also guided by input from several organizations. Among these were briefs from the Victorian Order of Nurses, Ontario Association of Medical Laboratories, the Ontario Hospital Association, the Ontario Council of Teaching Hospitals, and the Association of Nursing Directors and Supervisors of Ontario Health Agencies.

In general, a striking congruence of perspectives emerged in the responses of administrators, specialist physicians, front-line nursing and support staff, and unions representing the latter groups. The chapter focuses on areas for improvement; the consultants specifically solicited input on the strengths and weaknesses associated with the response to the outbreak and steps that might be taken to improve that response in the future. Most informants indicated that most participants indicated that the aspect of the response that allowed the system, in the end, to successfully contain the outbreak of SARS was the incredible effort made by front-line staff. This report focuses on opportunities for the future and thus is unable to give a full accounting of the valiant and sometimes heroic efforts of many of the public health and health care workers in the Greater Toronto Area [GTA] as they battled to aid those infected and contain the spread of the disease.

Last, we have deliberately kept our recommendations at a fairly high level of generality. This reflects considerations of mandate, time constraints, and the existence of two other processes to learn lessons from SARS in Ontario. We anticipate that more detailed recommendations applicable to the Ontario experience will be forthcoming from a provincial panel chaired by David Walker, Dean of the Faculty of Medicine at Queen's University and from Mr. Justice Archie Campbell's public health investigation.

8A. Scope and Approach

In total, the consultants conducted 25 focus groups and 21 interviews with organizations and individuals representative of those that were most directly involved in treating people infected with SARS and containing the spread of the disease. This included staff of nine hospitals, four public health units, Community Care Access Centres [CCACs] in Toronto, representative primary care providers, and officials of the Ontario Ministry of Health and Long-Term Care [OMHLTC].

They surveyed all acute care, rehabilitation and complex continuing care hospitals in the GTA regarding their readiness and experience with SARS. They received responses from all Toronto and GTA hospitals included in the survey[1].

The survey collected activity volume data for March, April, May, and June of 2002 and 2003. The four months in 2003 were selected to cover the period of the SARS outbreak. The data for the same four months in 2002 were collected to provide an approximate activity baseline, with the simplifying assumption that any major changes in activity levels could be attributed to the impact of SARS.

Much of the analysis of the hospital survey activity data focused on comparing the 2003 activity levels with the volumes for the corresponding month in 2002. Only hospitals with complete data for all eight months were included in the analyses.

Daily Census Summary [DCS] data were provided by the OMHLTC. These are records of the number of inpatients treated, patient days and type of service delivered in Ontario hospitals each day. These data support comparisons of changes in acute care hospital occupancy rates during the SARS outbreak.

Detailed, patient-specific records of inpatient and ambulatory procedure activity for the GTA and Toronto hospital patients receiving care during the SARS outbreak will not be available until late 2003. This means that there can be no direct analysis of the impact of SARS on hospital case mix and specific clinical groups. However, to provide some information about the normal case mix and clinical characteristics of the patients treated in Toronto hospitals, the Hay Group used the 2001/02 Canadian Institute for Health Information [CIHI] records for Toronto hospitals obtained previously for a benchmarking study. These data were then used to estimate the expected distribution by program of Toronto hospital activity during the period of the SARS outbreak and to support the estimate of the volume and cost of deferred surgical activity.

The Committee had hoped to examine physician service volumes but approvals from the OMHLTC to access the necessary data set had not been obtained at the time of preparation of this report. Researchers at the Institute for Clinical Evaluative Sciences will be undertaking analyses of physician practices as part of a broader assessment of process and outcome impacts from the outbreak.

As to the four roundtables convened by the Office of Nursing Policy, attendance follows:

- sixteen front-line nurses from eight organizations;
- nine participants from organizations representing nurses;
- six front-line support staff from three organizations; and
- four participants from organizations representing front-line staff.

Participants included full-time, part-time, and casual staff from various sectors. Categories of staff included: registered nurse, registered practical nurse, infection control practitioner, nurse manager, environmental services, dietetic attendant, porter, and patient service aide.

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[1] Some multi-site hospitals provided separate responses for each of their sites, while others provided a single response for the corporation.

8B. Readiness of the Health System

8B.1 Background

Key dates in the outbreak have already been presented in Chapter 2. To recapitulate, the index patients with atypical pneumonia were seen at the Grace Site of the Scarborough Hospital the week of March 10, 2003 and identified as potential SARS cases on March 14. Premier Ernie Eves declared SARS a provincial emergency on March 26. On or about March 28, under direction from the Provincial Operations Centre [POC], all GTA and Simcoe County hospitals restricted access to critically ill patients and necessary staff only. On March 29, these hospitals were also directed to "initiate full Code Orange emergency response plans." The Premier lifted the provincial emergency as of May 17, 2003.

A 'second wave' of SARS cases was confirmed on May 23, 2003. On May 27, the provincial government announced, "four hospitals, working with all Greater Toronto Area hospitals, will use their expertise and leadership in a coordinated fight against Severe Acute Respiratory Syndrome (SARS)." The four hospitals were North York General Hospital, St. Michael's Hospital, The Scarborough Hospital, General Division, and the Etobicoke site of the William Osler Health Centre. The Minister stated that "We are concentrating the treatment and expertise of SARS at four key sites around the Greater Toronto Area to ensure we quickly identify and contain the disease during this current wave of cases... This will help us protect the capacity of the health care system as well as ensure that the health care system in the GTA keeps running safely and efficiently[2]." These four hospitals are collectively referred to as the "SARS Alliance" hospitals.

For the purposes of this chapter, SARS I refers to the timeframe of approximately March 10 to May 17, 2003. This timeframe corresponds to the initial identification of SARS in Ontario and the response characterized by the declaration of a provincial emergency and oversight of outbreak management by the POC.

SARS II refers to the period beginning on or about May 18, 2003 and ending approximately June 30. This timeframe corresponds to the second cluster of SARS patients and the date of the final new case under investigation. Characteristics of the SARS II response include the SARS Alliance announced May 27 and the SARS Operations Centre [SOC] established by the OMHLTC.

8B.2 Roles and Responsibilities

During the initial stages of the outbreak, between approximately March 10 and March 26, 2003, various respondents were unclear on the roles and jurisdictional responsibilities of Health Canada, the provincial Ministry of Health and the regional Public Health Units. From their perspective, it was unclear, for example:

- who was to be the contact with the World Health Organization [WHO];
- who was responsible for keeping the system informed;
- who had the jurisdiction/role to issue press releases;
- who was to provide advice on proper infection control procedures and to whom; and
- whose definitional frameworks were to be used.

Respondents observed that these issues appeared to be a source of debate between the OMHLTC and Health Canada. The province assumed responsibility for communication with the public initially through the Public Health Commissioner and later through a subset of members of the Executive Committee of the POC. It became clear that Health Canada had responsibility for contact with WHO. However, respondents were concerned that it was not until May 29 that Health Canada announced a full alignment (or re-alignment) of its criteria for diagnosis of SARS with those of WHO.

Respondents felt that clarity in jurisdiction and role and more communication between Health Canada, the OMHLTC, and regional public health units would have eliminated some of the early confusion in addressing the outbreak. Front-line roundtable participants spoke of "fragmentation" in the system, "silos", and "chaos" during SARS I.

Provincial Government

Command and control for the operational response was somewhat clarified when the Premier declared SARS a provincial emergency on March 26, 2003 under the authority of the *Provincial Emergency Plans Act*. This activated the POC, made up of representatives from all necessary provincial ministries. Concurrently, each Ministry activated its own Ministry Advisory Group

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[2] Ontario Ministry of Health and Long-Term Care Press Release, "Eves Government announces four hospitals to lead coordinated fight against SARS." Toronto, May 27, 2003, Canada News Wire.

[MAG] to advise the POC and manage the emergency on behalf of its respective Ministry. Pre-selected individuals populated the POC and the MAGs. The consultants interviewed a number of individuals who had contact with the POC during SARS I. Most indicated that the multiplicity of participants, and the advice being provided by the MAGs (most of whom had little understanding or involvement with SARS), led to a perception of confusion and dysfunction at the centre.

Public Health Units

There was also confusion regarding the roles and responsibilities of public health units and their relationship to other parts of the system. The reporting relationship of Regional Public Health Units through local governments was perceived to be a source of uncertainty and conflict in their relationship with the OMHLTC Public Health Branch. Respondents widely reported that there was a lack of coordination of information and overlap of roles.

Public health units and hospitals alike reported that there was inconsistency in approach and activities across the public health units in the GTA. Respondents attributed the inconsistencies to the absence of a clear linkage and role for the units in the clinical sphere, the weak link of the units to the OMHLTC Public Health Branch, and a lack of leadership from the OMHLTC Public Health Branch.

A number of respondents criticized the municipal reporting relationship of the regional public health units. They acknowledged that a number of the current responsibilities of Public Health benefit from a local emphasis (health promotion, smog alerts, etc.), but argued that areas such as infectious diseases would benefit from a broader, provincial approach and responsibility. Health care providers suggested that government should undertake a review of Public Health activities with the goal of redistributing and clearly identifying responsibilities of local public health units and the provincial Public Health Branch of the OMHLTC. Respondents felt that roles, responsibilities, and accountabilities needed to be clearly defined and understood.

Hospitals

As one CEO indicated, the management of any new infectious disease in the absence of a scientific consensus on diagnostic criteria, etiology or treatment creates both apprehension and new challenges for hospitals and hospital staff in responding to the illness.

None of the hospitals contacted for this study has identified infectious diseases as a priority program; there is also no regional infectious disease program designated by the OMHLTC. Further, there is no formal network of infectious disease specialists and there is no regional mechanism to design or implement strategies to respond to an outbreak of infectious disease. It was reported that infection control specialists from hospitals have developed an informal network and some hospitals reported learning about the outbreak through that source. A regional infectious disease network and strategy is clearly needed.

Many respondents indicated that being prepared requires anticipation of a potential event and the availability of a planned response should it occur. The increasing prevalence of infectious disease outbreaks and challenges requires that surveillance be an ongoing hospital function, and that a planned response to an outbreak be available on both a routine and emergent basis.

Community Care Access Centres

CCACs are Ontario's clearinghouse for access to a range of home-based health and social services. They reported that the OMHLTC and hospitals did not use the expertise of CCACs to the extent that was possible. The CCACs could have provided greater support in the discharge and decanting of patients, particularly in the SARS Alliance facilities that were attempting to create the capacity to accept SARS patients. In some instances hospitals/physicians simply signed patients out without notifying the CCACs for tracking purposes, for arrangement of appropriate home support, or for appropriate protection of community workers.

Conversely, the Committee has learned that the CCACs in the GTA did not have ready access to infection control expertise or standardized protocols for dealing with SARS-like situations. The Victorian Order of Nurses took a number of steps that enabled home care nurses to participate effectively in the outbreak response. However, the home care system in general was not adequately integrated or prepared for an outbreak of this nature.

During SARS II, the OMHLTC announced that the Leisureworld Brampton Woods facility would provide services for patients, particularly from the SARS Alliance hospitals, that no longer required hospital care. Some informants felt that the same result could have been achieved with better outcomes (patients in facilities closer to home and more appropriate settings) if the Ministry had utilized the resources of the CCACs.

Inter-Organizational Interaction

Respondents reported that no system existed prior to the SARS outbreak for communication of routine infectious disease alerts from Health Canada to the operational levels of the health system (i.e., to hospitals, long-term care [LTC] facilities, CCACs, ambulance services, family physicians). Hospitals indicated that they had no direct communication from Health Canada regarding SARS.

Respondents also indicated that there was a lack of clarity regarding responsibility for alerting the various components of the health system to infectious disease risks when they are identified. Virtually all informants identified the need for a clear statement and assignment of responsibility for providing infectious disease alerts to each of the components of the health system including:

- regional public health units;
- family physicians;
- ambulance;
- hospitals;
- CCACs; and
- LTC facilities.

Several individuals suggested that such alerts must be in a format that is readily digestible by the different audiences that receive them. Further, the recipients themselves require a process to receive and appropriately disseminate such alerts. A number of individuals identified the Coroners' reports as an example of dissemination that works reasonably well: clearly labeled reports, identifying particular professionals who would have an interest in the specific findings and recommendations, and a process to disseminate results.

Feedback regarding interaction with WHO was unequivocal: Health Canada has responsibility for liaison with WHO and provinces and Health Canada must collaborate to meet our international obligations. Health Canada should communicate relevant WHO information to provincial Public Health Branches and local public health units. If Health Canada is departing from international recommendations (as in the SARS diagnostic criteria), it must follow a process that builds consensus and credibility with unambiguous explanations to all concerned.

Communication protocols regarding infectious diseases must include information flow in both directions: from local to provincial to federal levels and from the federal level back. Although local public health units have the responsibility to collect infectious disease information for reportable diseases at the individual case level, and providers are required to report such information to the public health units, Public Health does not have clear enough responsibility to report this information back to providers. Front-line workers expressed concern that Public Health focused on community contact tracing and quarantine to the exclusion of closer interaction with hospitals to identify how their processes and practices might be contributing to nosocomial infections.

Respondents believed that Health Canada should establish a surveillance role that enables it to accumulate and analyze the locally-collected information, and establish a communication process that alerts provincial public health units about unusual patterns in an appropriate form for dissemination back to providers. Finally, relevant WHO information should be analysed in concert with the locally collected information in the surveillance of unusual patterns.

In sum, post-SARS, clinical and public health leaders in the Toronto area were unambiguous in supporting an integrated and regional system of surveillance, reporting, and outbreak management for infectious diseases. Front-line roundtable participants similarly urged the establishment of coordinated outbreak management under a single authority.

8B.3 Emergency Structure/Planning

Due to the nature of the SARS emergency, there was some initial confusion/frustration between the POC, populated by individuals prepared broadly for emergency response, and the OMHLTC MAG with the content knowledge to address the SARS emergency. The POC, which had not previously been activated, had not developed a process to share responsibility. The POC and the OMHLTC MAG ultimately amalgamated and situated themselves in the same physical location. Respondents stated that this accommodation by the POC to the greater expertise of the OMHLTC significantly improved the functioning of the POC. This occurred within 72 hours of the declaration of the emergency.

The command-and-control structure of the POC, however, had not anticipated sharing responsibility/authority with a lead Ministry. There was perception that the roles of the Commissioner of Public Safety and the Commissioner of Public Health/Chief Medical Officer of Health overlapped, and it was unclear which position was ultimately responsible for the management of the emergency. Respondents reported that this lack of clarity in leadership led to confusion in the field.

It was also noted that the various areas within each Ministry had identified only one individual per area to populate the POC and the MAGs; there were no alternates. This quickly proved inadequate given a 24/7 workload. Below the level of the POC and the MAG, there appeared to be little infrastructure to assist in the workings of the MAGs in support of the POC or to support the POC itself.

Further, areas of expertise were missing. Insufficient input from the acute care sector meant that some of the early directives demonstrated a lack of understanding of the workings of either the health care system as a whole or the individual components of the system. Hospital respondents reported frustration with early directives that were unrealistic and often not possible to implement.

Consistent with findings and recommendations in Chapter 5, respondents suggested that a process be established to share the authority vested in the POC with a lead Ministry with content knowledge of the particular disaster. This process should include a clear statement of the position/person that has ultimate authority for a given emergency. Most recommended against a shared responsibility during a crisis. It was also noted that more than one individual from each Ministry should be identified to support the POC and the MAGs.

Several respondents also raised the question as to whether or not a provincial emergency actually needed to be declared in the SARS outbreak. They felt that the POC was a cumbersome structure for this particular emergency given that the response mostly required the efforts of a single Ministry. Others noted, however, that the declaration of the emergency was necessary to provide the government with the authority to make decisions and issue needed directives. As an alternative, informants suggested that key Ministries might develop their own individual emergency plans that provided the government with relevant authority to act and that such Ministry-specific plans need not involve the entire POC apparatus. If criteria for identifying Provincial versus 'Ministerial' emergencies could be set, this would allow for a more graded response rooted in sectoral expertise. Many felt that the SARS Operations Centre functioned more effectively than did the general Provincial Operations Centre.

It was also widely suggested that both the provincial and ministerial emergency plans consider closely the expertise that would be required in various emergency situations and identify ahead of time individuals with such expertise. As the SARS Scientific Advisory Committee demonstrated, such experts need not be employees of the provincial government. Rather, experts from across the province could be identified in advance and take part in exercises to pre-determine relevant emergency protocols.

Emergency plans should also consider compensation issues. Respondents noted that neither at the provincial nor ministerial level had emergency planning made advance provisions for compensation of those individuals required to respond to the emergency, as well as those affected by the particular emergency.

Again consistent with recommendations in Chapter 5, it was also suggested that the federal government be involved with the emergency planning of provincial governments to ensure that the federal role in various emergency situations is identified ahead of time.

Respondents identified the lack of any formal process or previous human resource planning for recruiting or seconding staff to public health units in the event of an emergency. It was almost universally felt that there is insufficient capacity in local public health units to address emergency situations. Respondents were grateful that London and Hamilton provided teams to assist the GTA public health units and noted that individuals were re-deployed internally to provide additional focus on the SARS situation. Public health units reported a lack of physicians with appropriate public health training, and some of those with this type of training were not available to the local units, as they had been seconded to the OMHLTC for the emergency.

A number of individuals suggested that there should be the ability to dispatch a team of professionals to the epicentre of a major outbreak if requested to do so. Such a team would be specifically trained to assess the outbreak and if necessary identify additional resources that could be accessed to contain the situation. The services provided by this team might range from infection control advice and specific staff education to actual patient care staffing. However, several respondents felt that sufficient health human resources do not exist for such an approach. It was suggested that an assessment of the expertise required to deal with infectious diseases be made and specific policies put in place to encourage the training of a sufficient number of such professionals.

Many hospital respondents noted that emergency preparedness policies and procedures are developed and tested at the level of the individual institution. No regional policies exist and there is little evidence of consistency of protocols among institutions.

There was a sense among focus group participants and interviewees that cooperation among hospitals was inadequate to the needs of the SARS emergency. A number of individual examples of sharing (non-union) staff with particular expertise were identified as positive exceptions. Participants noted a particular need for greater cooperation among hospitals in the following areas:

- transferring/accepting non-SARS critical care patients; and
- sharing staff (and physicians) with particular expertise.

Many suggested that the absence of a pre-existing plan or approach to cooperation among hospitals in an emergency situation was an impediment to effective action during the SARS outbreak. This was identified by several respondents both within and external to the hospitals.

In sum, it was clear that the Toronto public health system could not manage both the SARS crisis and carry on its day-to-day business. It was also clear that Toronto could not deal with more than one crisis at a time and that the system would crash if faced with one additional large-scale crisis. Without a pre-existing mechanism to share resources within the system and no surge capacity, Toronto was overwhelmed.

Managerial and front-line respondents alike urged that all levels of government invest in front-line public health capacity, in addition to, and not at the expense of, existing resources and core services. Both clinical teams and outbreak teams are needed when dealing with a health emergency. An adequate and consistent surge capacity across Canada must be developed and requires the collaboration of provincial/territorial and municipal governments to ensure that investments are made and needs met.

Code Orange is the internationally recognized code for an external disaster/emergency. Each hospital has developed its own policies and procedures to address Code Orange situations. A number of hospitals commented that Code Orange was not intended to deal with an outbreak of infectious disease; nor was it the most appropriate response for all hospitals in the system.

The survey conducted as part of this study requested that hospitals state whether there were formal protocols for outbreak management in place prior to the SARS outbreak. Almost 90% of the acute care hospitals and 78% of the non-acute hospitals reported having a formal outbreak policy in place (Exhibit 8.1).

EXHIBIT 8.1

Hospital Survey Responses re Existence of Formal Protocols for Outbreak Management

Hospital Location (County)	**Acute Care with Formal Outbreak Policy**			**Non-Acute with Formal Outbreak Policy**		
	Yes	***No***	***% Yes***	***Yes***	***No***	***% Yes***
Durham	4	0	100%	0	1	0%
Halton	5	0	100%	0	0	
Peel	3	0	100%	0	0	
Toronto	11	2	85%	7	1	88%
York	2	1	67%	0	0	
Total	**25**	**3**	**89%**	**7**	**2**	**78%**

Two of the three Toronto hospitals that reported no formal outbreak policy were SARS facility level 3 (the highest level) hospitals during the outbreak, while the third was level 2.

The survey also asked hospitals to provide a copy of their protocols for outbreak management. Eighteen facilities submitted copies out of the 32 facilities that reported the existence of such protocols.

The protocols received were of variable detail, clarity, quality and length. There are very different policies and procedures for dealing with outbreaks of infectious disease among the hospitals. In most cases, the protocols did not appear to provide sufficient information or instruction to define how to manage severe outbreaks. Most protocols had not been recently revised. Front-line respondents particularly emphasized the need for standard protocols and practice algorithms in outbreak management.

Some respondents indicated in interviews and focus groups that SARS showed that many hospitals, especially community hospitals, are unprepared to deal with serious outbreaks of infectious disease. They have relatively weak infection control functions and processes. Finally, some respondents urged that basic standards of cleanliness and standardized infection control practices and protocols be mandated across the health care system, including hospitals, LTC, home care, and the offices of independent health professionals. Some suggested that there be requirements, particularly for hospitals, to provide continuing education on basic precautions for physicians, nurses and other health professionals. Analogies were drawn to basic fire training required on an annual basis.

The lack of any regional hospital planning for emergency preparedness was also heavily criticized. It was strongly suggested that the emergency response plans of hospitals should include regional planning and cooperation. Such planning must include both inter-hospital participation and other providers and stakeholders as appropriate (i.e., CCACs, LTC facilities, Public Health, etc.).

A number of hospitals reported making use of existing networks, such as the Toronto East Emergency Network and the Child Health Network, to assist with communications and in some cases patient transfer.

CritiCall[3] was essential for a number of required patient transfers. Many hospitals, however, suggested that the powers of CritiCall to enforce acceptance of patients by facilities with open beds needed to be strengthened. Numerous situations were reported wherein hospitals had difficulty transferring patients both with and without SARS.

8B.4 Hospital Facilities

The hospital survey included questions regarding the preparedness of the hospital facilities to accommodate SARS patients. Exhibit 8.2 shows the number of single patient rooms with anterooms and/or negative pressure in the GTA and Toronto acute care hospitals. Overall, 3.8% of Toronto and GTA acute care hospital beds are in single negative pressure rooms. Only 1.0% of Toronto and GTA non-acute care hospital beds are in single negative pressure rooms.

Toronto hospitals have the highest percent of rooms with negative pressure (4.6% of acute beds, 1.0% of non-acute beds). The range in the percent of acute care beds equipped with negative pressure for individual hospitals (shown in Exhibit 8.3) is from 0% to 12%.

Of the 28 Toronto and GTA hospitals with emergency departments, 6 reported in the survey that they do not have an infection control area. The hospitals without infection control areas in their emergency departments are distributed as follows:

- two in York;
- three in Toronto; and
- one in Durham.

EXHIBIT 8.2

Hospital Survey Responses re Anterooms and Negative Pressure Rooms in Acute Care Hospitals by Hospital Location

Acute		Hospital Location (County)					
Anterooms?	**Negative Pressure**	**Durham**	**Halton**	**Peel**	**Toronto**	**York**	**Grand Total**
Yes	***No***	–	8	31	7	12	58
Yes	***Yes***	11	14	22	147	20	214
No	***Yes***	3	13	2	140	2	160
	Total Beds:	552	830	1,445	6,254	800	9,881
% Beds w/ Anterooms		2.0%	2.7%	3.7%	2.5%	4.0%	2.8%
% Beds w/ Neg. Press		2.5%	3.3%	1.7%	4.6%	2.8%	3.8%
% Beds w/ Both		2.0%	1.7%	1.5%	2.4%	2.5%	2.2%

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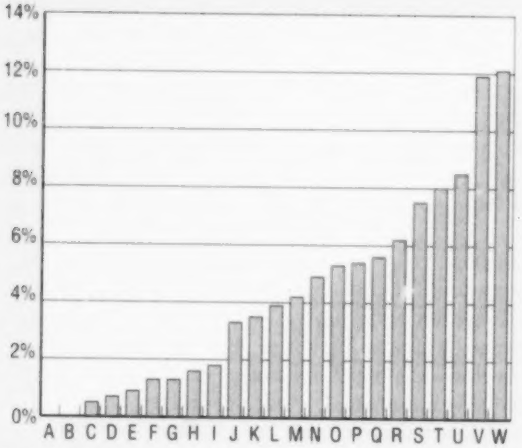
[3] The Ontario CritiCall Program facilitates emergency patient referrals by assisting physicians in community hospitals with access to the resources of larger tertiary care hospitals in their regions. Management of the program is provided by Hamilton Health Sciences (HHS).

EXHIBIT 8.3

Variation in Percent of Toronto and GTA Hospital Acute Beds in Single Negative Pressure Rooms (only hospitals with at least 100 acute beds)



The survey results show that 18% of monitored intermediate/critical care beds are equipped for infection control. The percent equipped for infection control ranges from 10% in Halton to 28% in Peel.

Only 30% of hospitals with autopsy suites reported that their suites conformed to CDC guidelines.

All hospitals as well as front-line workers commented on the lack of capacity to accommodate the surges in demand that often accompany emergencies. If it needs to operate regularly at 90% to 95% of capacity (as is the case for acute medical beds), the system is unable to absorb a large influx of patients associated with an emergency while still maintaining normal activity levels. In addition, the rest of the system lacks capacity to absorb volume if some hospitals have to reduce volumes to deal with an emergency, as occurred during SARS when some hospitals' ICUs became compromised. Some hospitals did indicate that the elective elements of normal activity could be temporarily suspended, if needed, to provide sufficient resources to deal with the emergent situation. However, such interruptions would have to be brief and accompanied by provision for catch-up capacity.

The SARS Alliance facilities noted that, with no regional disaster planning in place or previously identified methods for cooperation between facilities, it was very difficult to transfer non-disaster (non-SARS) related patients to other facilities. The concept of designating entire facilities as 'level 3' on the Ministry's SARS scale, rather than specific units of a hospital where a breach had occurred, led to confusion and a transient stigmatization of entire institutions. A number of patients were refused, despite the transfer protocols, simply because they were coming from a level 3 facility.

Given the impact and potential increase in prevalence of infectious disease outbreaks, a number of suggestions regarding appropriate infrastructure were also brought forward. Specifically, respondents suggested that each emergency room be equipped with isolation facilities with appropriate air handling and anterooms. They also suggested that the number of negative pressure rooms in hospitals be expanded. These facilities would, in the event of an outbreak, be temporary treatment areas prior to transfer to a regional facility (or facilities) with responsibility for caring for and isolating patients with the infectious disease. If patients could be congregated in regionally-designated institutions, the rest of the system could carry on in addressing the other health and health service needs of the population.

It was suggested that one or more institutions in each region of the province should have the necessary infrastructure to isolate a large number of patients in an emergency situation. These institutions would require both the facilities to accommodate a large number of patients suffering from infectious disease, and the staff required to treat them.

If regional programs in infectious diseases were established, the institution(s) with the facilities for addressing the outbreak should also be the locus for the program. Many suggested that it would be unrealistic to expect a single institution to be home to sufficient infectious disease and infection control expertise to deal with a crisis. Rather, a network of providers should be created that could collectively focus on each outbreak and realign themselves to ensure that the needed resources are available to the regional facility in the event of an outbreak.

8B.5 Communications Structures and Processes

As noted, respondents reported that there was not a seamless and effective system prior to the SARS outbreak for communication of routine infectious disease alerts from Health Canada to the operational levels of the health system (i.e., to hospitals, LTC facilities, CCACs, ambulance services, family physicians).

The interviewees and managerial/physician focus group participants indicated that communications related to SARS came from various components of the health care system, with no clearly identified source and often with conflicting and/or out-of-date advice. Communications came from:

- Public Health Commissioner;
- Regional Public Health Units;
- Provincial Operations Centre;
- SARS Operations Centre;
- Ontario Hospital Association;
- Ontario Medical Association;
- Ministry of Health and Long-term Care;
- Public Health Branch, OMHLTC;
- Institutions Branch, OMHLTC;
- Ministry of Public Safety and Security; and
- Health Canada.

There was neither the mechanism nor the discipline required to consolidate and control communications within the POC. Theoretically, the POC should have been the single source for communications for all providers. This was not the case. Various reasons for this were postulated; chief among them was a lack of clarity of role and jurisdiction and a need for organizations to be seen to be active in supporting their constituencies.

As noted above, the field also heavily and repeatedly criticized both the process of issuing directives and the content of directives from the POC. Front-line staff emphasized that, especially early in the outbreak, it appeared that those formulating directives were not sufficiently knowledgeable about the practicality of implementing these practices in the clinical setting.

Criticisms also included:

- lack of clarity around who the POC was and who was directing its activities;
- frustration that teleconferencing did not allow participants to know who was participating in the POC, and whether the participation was informed by science or political necessities;
- length of time required to issue directives, which in turn was attributed to delays occasioned by the internal review and approval process;
- inconsistency in directives;
- initial directives not numbered or signed; and
- lack of a pre-defined process to clarify directives.

Some of these criticisms are not entirely consistent with others; speed in issuing directives may lead to lack of clarity while delays led to criticisms about lack of leadership. Regardless, the criticisms speak to an opportunity for improved performance.

Respondents had a mixed response to the mechanism/media used for communications by the POC. Many stakeholders expressed frustration with the length and frequency of teleconferences. However, many also stated that this was a timely method of disseminating quickly changing information. After the first few days, respondents reported that the effectiveness of the teleconferences improved.

Some respondents felt that the difficulties associated with the communications process could have been alleviated if the OMHLTC had its own emergency preparedness plan separate from that of the POC. It was overwhelmingly suggested that regardless of the emergency situation declared, responsibility for communications should be identified clearly in the various scenarios and that mechanisms be established to enforce a single communications source.

Numerous comments were received highlighting the need to ensure that all interested stakeholders receive appropriate communications. Clearly, interested stakeholders will vary depending on the situation. However, many respondents suggested that appropriate contact sheets could be prepared ahead of any particular emergency situation to ensure, for example, that family physicians and local Public Health Units[4] receive information at the initiation and throughout an outbreak situation.

Finally, almost all respondents felt that a process must be in place to attempt to minimize frequent changes to information and conflicting information in an emergency.

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[4] It is curious that initial directions from the POC were not made available to public health units. CCACs reported providing information to public health units that the public health units did not seem to be receiving directly.

In sum, the overwhelming sense obtained by the consultants was that SARS demonstrated the importance of effective communication during an emergency, both domestically and internationally. Poor communication during the SARS outbreaks may have contributed to the imposition of a travel advisory by WHO, harming Canada's economy and reputation. The use of a myriad of spokespeople speaking to the media at the same time with messages that sometimes conflicted did nothing to instill confidence in the public health system and undermined the credibility of those at the helm. Respondents noted that uneven communication to other affected sectors, such as the travel sector, created confusion and fear for both the public and people working in those other sectors. The travel sector, severely affected by SARS, should have been kept better informed and better utilized in disseminating information and easing public anxiety. Pharmacists as front-line health care professionals also could have been better utilized to convey important messages.

Public Health

There was no effective mechanism for medical officers of health [MOH] to communicate amongst themselves and to coordinate their actions during the outbreak. Conference calls among the MOH were arranged but not consistently attended by all units. Many clinical leaders commented that the MOH in the various regions were disconnected from each other.

Participants also expressed frustration that communications from the public health units were non-existent or sporadic; in their view, much information was provided *to* Public Health, but little information came *from* Public Health. Hospitals reported receiving inquiries from multiple public health units for the same information regarding the same patient. When notified that the information had already been provided to a different public health unit, hospitals were told that the units did not have mechanisms to share the information amongst themselves and that it was easier to collect it again from the hospital.

Some hospitals anticipated that the role of Public Health was to consolidate, analyze and communicate back in some useful fashion the information that it was collecting. Public Health informants felt that they could not share information because of confidentiality restrictions, because they did not have sufficient resources to share information, or simply because it was not their responsibility to communicate back to providers. It is unclear, therefore whose role this was. Either expectations must be modified or mechanisms found to close the communications gap.

The role assumed by most public health units was focused on front-line containment of the outbreak. As noted earlier, along with their front-line staff, several hospital leaders had expected advice from the public health units on infection control and quarantine procedures and enforcement; these expectations were not consistently met. Providers were unsure if this was or should be a role for provincial or regional level Public Health.

Confidentiality concerns raised by Public Health were shared by health care providers who argued that they, too, have a responsibility and tradition of maintaining confidentiality. Hence, some sharing of information should have been possible.

Family Physicians

There was no regular connection between Public Health and family physicians during the outbreak. The role of Public Health in relation to physicians' offices is not clear. Those contacted for this study indicated that they have no relationship with Public Health and received no communication from their local public health unit. Family physicians were unaware of the outbreak until after it had occurred and were unclear what precautions should be taken in their practices and unclear whose responsibility it was to provide them with such information.

Family physicians were also largely unaware of Health Canada infectious disease alerts. They did not know whose role it is to provide such alerts to family physicians.

Most family physicians reported learning of the outbreak initially through the media. Formal communications with the SARS emergency infrastructure were non-existent. Initial communications (such as the location of SARS clinics) came from the media; subsequently, the Ontario Medical Association provided communications that respondents found useful and effective. Those actively involved with a hospital received information and advice from the hospital. There was no direct communication from Public Health to physicians' offices.

Community Care Access Centres

CCACs were not receiving any official infectious disease communications from any source prior to the Toronto outbreak. Like others in the system, CCACs have no direct relationship with Health Canada, although they do monitor Health Canada information for product alerts. It was unclear to CCACs whose role it is to alert them about emerging infectious diseases or outbreaks. Respondents reported that Public Health and the CCACs sometimes provided conflicting information to CCAC clients. These members of the public were accordingly unclear if the CCACs or Public Health were the appropriate source for information.

Hospitals

No hospital reported receiving infectious disease alerts from Health Canada or having a formal system in place to receive or scan for such alerts. A number of hospitals reported awareness of Health Canada product alerts and bulletins, but they had no formal link to Health Canada. Hospitals reported that they became aware of the Toronto SARS outbreak through the media and communications from the Public Health Branch of the OMHLTC. One CEO stated that in the UK public health is more integrated with other elements of the health system. He had learned that in the UK, public health informed hospitals about the emergence of a new respiratory illness from China in February 2003, whereas in Toronto, hospitals did not know about SARS until the patients contracted the disease at The Scarborough Hospital, Grace Division in March 2003.

Virtually all hospitals commented that throughout SARS I, it was not clear who was sending directives to the hospital. Early directives were unsigned. Later directives were signed by both the Commission of Public Health/ Chief MOH and the Commissioner of Public Safety and Security. In either event, some hospitals were not initially clear how to get clarifications of the directives or raise concerns about them.

All hospitals commented on confusion arising from:

- receipt of information from different sources;
- conflicting information;
- frequent changes to information and directives;
- conflicts between directives and expertise and experience of staff; and
- impracticality of directives in the hospital situation.

Administrators and staff at all levels expressed frustration with an inability to implement the directions received. The most common reasons for failing to implement directives were:

- unavailability of supplies identified in directives; and
- timing of receipt of directives (i.e., insufficient notice to allow implementation).

A number of respondents felt that more input from the front-line staff actually dealing with SARS patients might have improved the practicality of the directions from the POC and the SOC.

Front-line respondents also commented on internal communications. They appreciated the effort made by institutions to communicate creatively by formal and informal channels, but, consistent with comments in Chapter 5 on risk communication, urged that spokespeople acknowledge 'the unknowns' rather than hold back information.

Many indicated that there is a need to strengthen the relationship and communication between public health and hospitals. Although there is a statutory requirement that representatives of the MOH sit on infection control committees in hospitals, these individuals often lack a strong clinical background and may therefore have little understanding of hospitals. As a result, they are unable to effectively liaise between the hospital and public health or provide useful advice to the hospital. Most hospitals in particular felt that they had little access to regional public health officials. And when they did have access, hospitals were concerned that public health staff may not have the necessary knowledge, skills or experience to provide appropriate advice to the hospitals regarding infection control.

Exhibit 8.4 shows the responses from the hospital survey regarding liaison with Public Health. While most hospitals (89%) reported regular liaison with Public Health, in some instances the liaison appeared to be little more than the mandatory communication regarding reportable communicable diseases or having representatives on Infection Control Committees. Despite the statutory requirement, 35% of hospitals did not mention Public Health representation on committee structures when asked to describe how they kept in contact with Public Health. These findings emphasize the need to ensure that there is close liaison between local public health units and hospital infection control.

Also, hospitals and clinical leaders commented critically on the number of requests for information from Public Health regarding SARS patients. Hospitals reported receiving requests for information from more than one regional health unit, the Public Health Branch of the OMHLTC as well as from the Ministry per se.

EXHIBIT 8.4

GTA and Toronto Hospital Survey Responses re Regular Liaison with Public Health

Hospital Location (County)	Hospitals Reporting Regular Liaison with Public Health		Hospitals Reporting Public Health on Infection Control Committee	
	Yes	*No*	*Yes*	*No*
Durham	4	1	3	2
Halton	4	1	4	1
Peel	3	0	3	0
Toronto	20	1	13	8
York	2	1	1	2
Total	**33**	**4**	**24**	**13**
% Yes	**89%**		**65%**	

8B.6 Surveillance

Surveillance emerged as another area of diffused responsibility. Local public health was geared towards outbreak containment; provincial Public Health did not take on the role of the collection point for assembling and facilitating the analysis of the cumulating data. There is no body with the jurisdiction at the overall system level to:

- accumulate and analyze information definitively or facilitate such analysis by others;
- identify and communicate findings of the analysis of patterns of occurrence;
- identify and communicate alerts of unusual patterns; and
- develop contingency plans.

Although some public health units reported that they were assisting hospitals with syndromic surveillance to identify patients with SARS-like symptoms, hospitals indicated that these cases were not confirmed by public health if an epidemiologic link to a confirmed case was not present. Some hospitals felt that the focus on epidemiologic links blunted their vigilance.

8B.7 Health Human Resources

A number of hospitals identified insufficient numbers of specialized staff as a challenge in dealing with the outbreak. The most commonly cited deficiencies were infectious disease specialists, infection control physicians and hospital epidemiologists.

While 71% of acute care hospitals reported having access to a physician trained for infection control, one quarter of these hospitals reported that the position was not paid and protected, leaving 46% of acute care hospitals without a paid and protected infection control position. Only 1 of 9 (11%) non-acute hospitals had a physician trained for infection control (this position is not paid and protected). Collectively, the consultants' survey suggested that the Toronto and GTA hospitals have at most 7 FTE paid and protected specialized infection control physicians (or 0.7 FTE positions per 1,000 acute care beds). This may be an over-estimate based on the Committee's own tally. The number of fully-trained hospital epidemiologists is even lower.

These observations clearly reinforce findings from Chapter 7 about the state of infection control human resources and the need for action as regards accreditation standards or regional/ministry regulations to strengthen infection control.

Numerous individuals noted that the nature of the collective agreements makes it virtually impossible to have full-time employees of one institution work across multiple organizations, unless each of the organizations employs the person directly. Sharing of staff in emergency contravenes existing collective agreements. Front-line staff and their organizations signaled a high degree of dedication and a willingness to engage in planning for emergencies, along with dissatisfaction with *ad hoc* and *post hoc* human resource practices during the SARS outbreak.

Several hospitals identified that the high percentage of nursing staff working part-time or casual hours through agencies was a problem during SARS, a point echoed by front-line focus groups. These types of employment practices provide a flexible workforce for the peaks and valleys in demand inherent in hospitals, but result in staff being employees of several institutions simultaneously. Front-line workers highlighted the importance of a stable and permanent workforce, rather than reliance on more costly agency personnel. Although a great deal of publicity centred around the potential increased risk of infection being transferred across organizations arising from this practice, respondents were not aware of a single case of SARS transmitted from health care workers working in multiple institutions (in fact, it appears there was only one such case). Restrictions on movement of staff during the outbreak may have mitigated this potential problem. However, the challenge associated with such arrangements arises from:

- staff needing to be familiar with the different infection control policies and procedures of multiple organizations;
- difficulty engendering the level of commitment to an organization that is required to respond to emergencies; and
- difficulty for a hospital to secure additional shifts when employees have commitments to work at multiple organizations.

There were various issues identified with compensation throughout the SARS experience. Some hospitals reported being 'required' to pay physicians additional stipends to induce them to work with SARS patients. The Ontario Medical Association and the OMHLTC, working through the Physicians Services Committee, have developed two programs for physicians whose incomes were affected by SARS. These programs are the SARS Advance Payment Program and the SARS Income Stabilization Program. Details of these programs were made available to physicians on the Ontario Medical Association website in a series of communications dated June 26, 2003.

In the SARS Advance Payment Program, physicians may apply for advance payment against future billings to address current shortfalls in income due to service reductions as a result of SARS. In this program, a physician whose income is less than 80% of average monthly billings may receive payments to make up the difference between the earned amount and the threshold of 80% of average billings. These advances will be deducted from future payments. This program applies to the period from March 14, 2003 to June 30, 2003.

The SARS Income Stabilization Program applies to physicians whose incomes were reduced because of quarantine, reductions in hospital operating capacity or reduced practice volumes in and/or outside the hospital setting. All physicians affected by SARS are eligible to receive payments equivalent to the difference between the amount earned and 80% of average annual billings. Physicians who worked in hospitals that were specifically treating SARS patients are eligible for payment of the difference between the amount earned and 100% of average annual billings. Top up to 80% applies to the entire SARS emergency period. Top up to 100% applies to the period from May 23, 2003 to June 30, 2003.

The SARS Alliance hospitals chose to provide double-time pay to those individuals working in SARS affected areas/SARS units. The OMHLTC did not sanction this action. It was heavily criticized from an equity perspective since other hospitals that treated SARS patients did not provide the same benefit to their staff. Further, staff were provided the additional salary whether or not the SARS unit they worked on actually treated SARS patients. As a result, in some cases staff treating SARS patients received no added compensation benefit, while others who did not treat SARS patients did receive additional compensation.

The lack of intensive care nursing professionals, and the centralized response to this challenge, resulted in compensation practices that were also heavily criticized. A contract between the province and Med-Emerg was established to provide critical care nursing staff to hospitals upon their request. Respondents noted that the nurses employed by Med-Emerg were compensated at rates up to three times that of 'regular' hospital-based critical care nurses, causing equity concerns. Front-line representatives expressed concern about both differential compensation and inconsistent perquisites. Because of uneven pay scales, some hospitals felt compelled to offer their own staff the same premium that the OMHLTC was paying to agency staff from Med-Emerg. Further, a number of hospitals reported that nurses who would otherwise have been regularly available to the institution were recruited by Med-Emerg. Finally, hospitals reported limited flexibility in the staffing offered by Med-Emerg; the hospital was unable to modify staffing requirements and consequently, they sometimes found themselves in the uncharacteristic position of having too many staff. Despite these criticisms, as indicated in Chapter 2, Med-Emerg was understood to have filled serious gaps in staffing in a very difficult period.

During the outbreak, nurses were restricted from working in multiple institutions to control the risk of SARS moving from one hospital to the next. This provision served to reduce the incomes of nurses who relied on income from multiple organizations. Respondents noted that the OMHLTC has not volunteered to compensate these nurses in the same way that it has guaranteed the incomes of most physicians who work in hospitals.

These findings all highlight the need for regularized processes for sharing and compensating staff during emergencies.

Occupational health and safety concerns emerged clearly from focus groups with front-line workers. Existing occupational health and safety committees were not engaged; necessary equipment was sometimes unavailable or suboptimal, and some administrators lifted precautions prematurely. The Committee understands that ambulance personnel and paramedics also had serious concerns about protective equipment during the SARS outbreak.

8B.8 Psychosocial Implications of SARS

Many respondents also discussed the significant psychosocial implications of SARS and related stories that illustrated the palpable fear among both health workers and the public. The impact of SARS on individuals working within the health system should not be underestimated. It included:

- people afraid to go to work in hospitals;
- people afraid to care for SARS patients;
- people afraid to associate with health care workers, or even spouses of health care workers, particularly those from SARS units;
- lingering resentment of colleagues who might not have contributed what was expected;
- people feeling helpless, angry, and guilty; and
- people experiencing acute social isolation and ostracism.

Many who participated in the interviews and focus groups suggested that the fear was engendered both by the sensationalism of the media coverage and inconsistent information coming from the provincial and municipal public health officials. Front-line focus group participants emphasized the need for formal crisis communications protocols suited to the unique needs of each institution and its staff (e.g., remote workers, shift workers). Much of the fear was simply a reasonable reaction to an unknown but extremely virulent disease. In spite of these fears, the focus groups yielded many accounts of heroic efforts of health workers to support each other and to ensure that all patients received the best care possible.

8C. Services Impact and Backlog Estimates

All focus group participants and interviewees referred to the impact of the SARS outbreak on hospital activity volumes, and the challenges posed in attempting to clear backlogs. Hospital activity data from 2002 and 2003 were used to document the impact of SARS on the GTA and Toronto hospitals and to estimate the cost to the hospital system to clear the backlog.

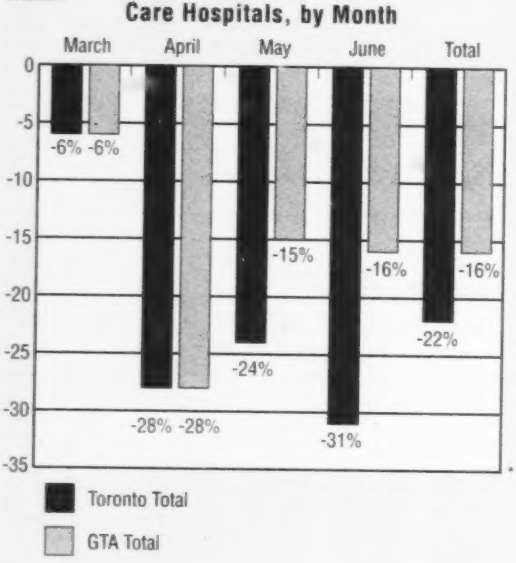
The primary impacts on hospital service volumes were the result of the directives to GTA and Toronto hospitals at the end of March that required that they restrict access to only critically ill patients. Because most surgical patients are elective, this restriction had the greatest impact on surgical volumes. The physical limitations on access to hospitals and the increasing public awareness of the risks of SARS in health care facilities meant that visits to emergency departments [ED] were also greatly reduced.

8C.1 Impacts on Emergency Department Visit/Admission Volumes

Exhibit 8.5 shows the year-over-year percent change from 2002 to 2003 in ED visits, by month and hospital location (GTA and Toronto).

EXHIBIT 8.5

Reduction in ED Visit Volumes in 2003, Compared to 2002, for Toronto and GTA Acute Care Hospitals, by Month



During the first full month of the outbreak (April 2003) visits to the ED were 28% below the April 2002 levels for both the Toronto and the GTA hospitals. After April, ED visits to the GTA hospitals recovered to levels approximately 15% below the prior year's level. Visits to the ED in Toronto hospitals increased slightly in May (to 24% below the prior year), but fell to 31% below the prior year in June with SARS II. The hospitals assigned to the SARS Alliance had a 50% reduction in their ED visit volumes in June (after the Alliance had been established).

Exhibit 8.6 shows the overall changes in ED volumes by Canadian Triage Acuity Scale [CTAS] scores.

EXHIBIT 8.6

Reduction in ED Visit Volumes in 2003, Compared to 2002, by CTAS Score, for Toronto and GTA Acute Care Hospitals, by Month

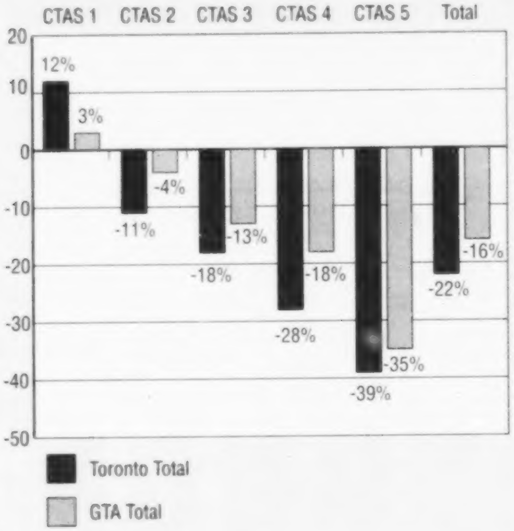
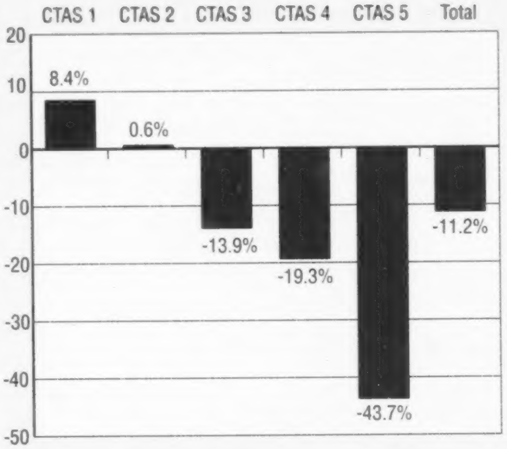


EXHIBIT 8.7

Reduction in Admissions of Patients via the ED in 2003, Compared to 2002, by CTAS Score, for Toronto and GTA Acute Care Hospitals



Overall, during the four-month period, the volumes of ED visits with CTAS score 1 (the most urgent cases) increased by 3% in the GTA hospitals and 12% in the Toronto hospitals. The volumes of ED visits with CTAS score 5 (the least urgent cases) decreased by 35% in GTA hospitals and by 39% in Toronto hospitals.

As would be expected, the ED visit volumes fell the most for the visits that would most likely be considered to be deferrable. There is no way to determine whether these patients who would normally attend and receive care in an ED received care elsewhere, e.g., in a family physician's office or drop-in clinic, or went without care. Lack of access to OHIP physician service data precluded this analysis.

For medical and mental health patients, the most common route of entry to the hospital is via the ED[5]. It would be expected that the most critically ill patients, who require admission to hospital for definitive treatment, would continue to visit the ED and would continue to be admitted as inpatients. Exhibit 8.7 shows that although there was an 11.2% decrease in admissions via the ED in the four months in 2003 compared to the same four months in 2002, the decrease was exclusively due to decreases in admission of the least urgent patients. Admissions of CTAS 1 (resuscitation) patients increased by 8% and admissions of CTAS 2 (emergent) patients remained constant.

The reduction in admissions through the ED is progressively greater for the CTAS score 3, 4, and 5 visits. This suggests that the SARS outbreak and the restrictions on hospital services led to changes in inpatient admission thresholds, and that patients who would have been previously admitted were not admitted.

This study does not assess the impact of the reduction of ED visit volumes on the health of the population nor can it determine whether patients who would otherwise have attended the ED were able to receive appropriate care elsewhere. The sustained reductions in ED visit volumes during the outbreak suggest that the Toronto and GTA EDs have traditionally accommodated a large number of ambulatory care visits that might be handled by a reformed primary care system, and that when disincentives to visit the ED were introduced, these visit volumes dropped.

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[5] In 2001/02 68% of medical admissions and 81% of mental health admissions for GTA and Toronto hospitals entered via the ED.

8C.2 Surgery Volumes

The hospital survey asked that hospitals report their surgical volumes (ambulatory procedures, inpatient elective cases, inpatient non-elective cases) for March, April, May, and June of 2002 and 2003. The analyses presented here compare 2003 volumes with 2002 volumes for the four months.

Of all Toronto and GTA hospital ambulatory procedure cases, 98.2% are considered to be elective. When the directives to restrict activity to critically ill patients were published, ambulatory procedures and ambulatory clinic visits would be the first services to be reduced or eliminated. Exhibit 8.8 shows the reduction in ambulatory procedure volumes from 2002 to 2003.

In April 2003, ambulatory procedure volumes dropped by 56% in the GTA hospitals and by 70% in the Toronto hospitals, compared to April 2002. In May 2003, GTA hospital ambulatory procedure volumes rebounded to a level 3% above the prior year. Toronto hospital ambulatory procedure volumes in May were only 7% below the prior year. SARS II appears to have had very limited impact on ambulatory procedure volumes, with the GTA hospitals only 1% below, and Toronto hospitals 5% below, the prior year. The majority of the ambulatory procedure backlog was caused in April.

Exhibit 8.9 shows the impact of the SARS outbreak on inpatient elective surgery volumes in the Toronto and GTA hospitals. In April, the reductions in surgery were greatest for the Toronto hospitals, but for both the GTA and Toronto hospitals, the percent reduction was not as great as it was for ambulatory procedures.

Although GTA inpatient elective surgery volumes for May showed a significant increase over April, they stayed 13% below the level from the previous year. In June, the drop in volumes for inpatient elective surgery for the GTA hospitals was even greater, at 21% below the prior year. The Toronto hospitals followed a similar pattern, with inpatient elective surgery volumes 15% below the prior year in May, and then further below (24%) in June.

Thus, during the initial outbreak (in April), the drop in ambulatory surgery activity was greater than the drop in inpatient elective surgery, whereas during May and June, ambulatory surgery volumes returned almost to normal while the volume of inpatient elective surgery remained depressed. One explanation is a lack of critical care capacity in the hospitals, since complex inpatient elective cases (e.g., most cardiac surgery, most thoracic surgery, most neurosurgery, etc.) are more likely to require a critical care stay.

EXHIBIT 8.8

Reduction in Ambulatory Procedure Volumes from 2002 to 2003 by Month and Hospital Location

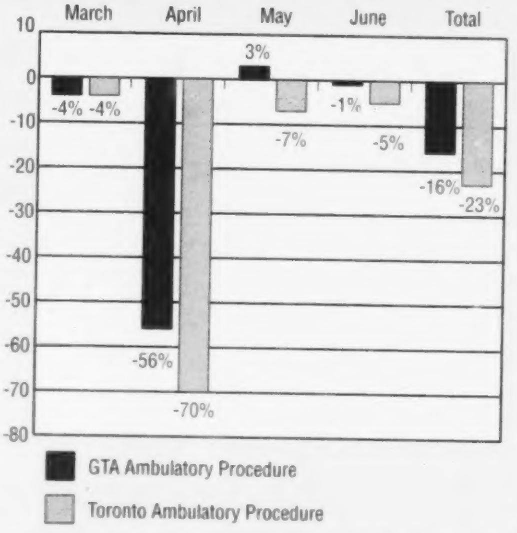
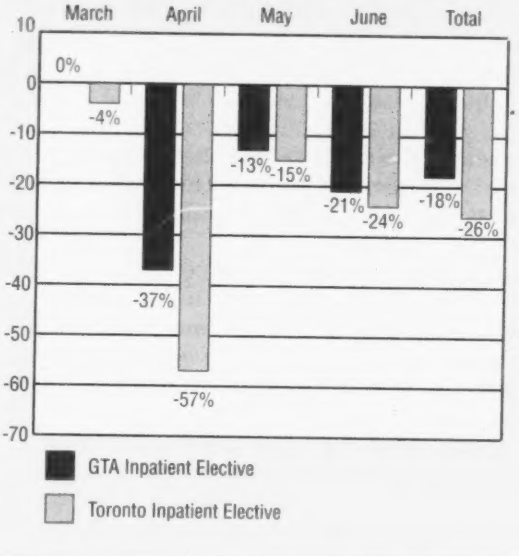


EXHIBIT 8.9

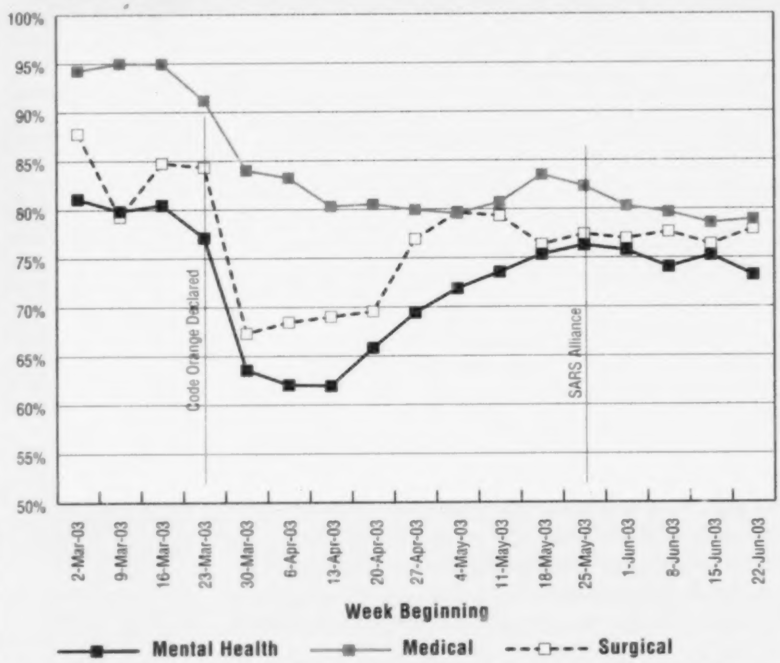
Reduction in Inpatient Elective Surgery Volumes from 2002 to 2003 by Month and Hospital Location



The inpatient non-elective surgery patients would be expected to fall into the category of critically ill patients, who would be given priority with little reduction in volumes caused by the activity restrictions imposed as a result of SARS. Non-elective surgery volumes for each of the four months were generally within 10% of the previous year's volume. For the GTA hospitals, non-elective surgery volumes were actually higher than the prior year for three of the four months (and only 1% lower in May). For the Toronto hospitals, non-elective surgery volumes were higher during SARS I, but lower during SARS II. The higher non-elective surgery volumes could be a result of hospitals re-categorizing patients from elective to non-elective, year-over-year growth in volumes, or random variation.

EXHIBIT 8.10

2003 GTA and Toronto Hospital Bed Occupancy for Medical, Surgical, and Mental Health Beds by Week



8C.3 Patient Days and Occupancy

The OMHLTC provided daily census and bed numbers, by bed type, for GTA and Toronto hospitals for March, April, May, and June of 2003[6]. Exhibit 8.10 shows the change in occupancy of medical, surgical, and mental health beds from the beginning of March to the end of June.

The vertical bars on Exhibit 8.10 show the date that the Code Orange directive was published and the date that the SARS Alliance hospitals were assigned.

In early March 2003, medical bed occupancy averaged 95%. High occupancy (over 90%) in medical beds is associated with off-service placement of patients and more frequent transfers of patients between services. This can present infection control challenges as patients are moved from one unit to another, sometimes temporarily placed on units where the staff may be unfamiliar with their care requirements.

During SARS I, medical bed occupancy dropped to 80%. It recovered to almost 85% by mid-May, but dropped again to 80% during SARS II.

In early March 2003, surgical bed occupancy was 88%, with a drop to 80% during the March school break. It dropped from 85% just prior to the declaration of Code Orange to 68% immediately following the declaration. From late April until the end of June, surgical bed occupancy stayed between 75 and 80%.

Occupancy of mental health beds dropped from 80% prior to SARS I to 62% in mid-April. It rose to 75% by mid-May and stayed close to 75% until the end of June (when it dropped slightly to 73%). The drop in mental health bed occupancy is surprising since most mental health admissions (94.5%) are considered non-elective. This drop is likely related to the reduction in ED activity, since most mental health inpatients are admitted via the ED. There was no way, with the available data, to assess the impact of the reduction of mental health inpatient activity on mental health patients (or potential patients).

The occupancy data show that the introduction of Code Orange had the most immediate and greatest impact on surgical beds. There was also a large occupancy reduction for mental health beds, particularly in Toronto

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6 At the time that this report was prepared, not all Toronto and GTA hospitals had reported their occupancy data for June 2003. Only hospitals with complete data for all four months are included in the analyses. Data were missing for June 2003 for four acute care hospitals—Toronto East General, St. Joseph's Health Centre, Sunnybrook and Women's, and St. Michael's Hospital (which was a SARS Alliance hospital).

community hospitals. The reduction in occupancy for medical beds was not as rapid or as large.

Exhibit 8.11 shows that prior to the establishment of the SARS Alliance the hospitals that would become Alliance members maintained overall bed occupancy rates better than the other hospitals. We speculate that this is because two of the hospitals (St. Michael's and Sir William Osler) had very limited SARS volumes in SARS I, and the Scarborough General site would have taken on overload from the closure of the Grace site. After the Alliance was established, overall bed occupancy in the Alliance hospitals dropped to 50%. However, this figure may be somewhat misleading. A major contributor to the drop in occupancy in SARS Alliance hospitals was the virtual closure of North York General Hospital. Furthermore, data from one of the four SARS Alliance hospitals, St. Michael's Hospital, were not available for analysis. At the same time, the non-Alliance hospitals were able to maintain an overall occupancy rate of 85% during SARS II.

Exhibit 8.12 shows that during SARS II (and after the establishment of the SARS Alliance) the overall hospital acute care bed occupancy was approximately 80%, much lower than the above 90% rate in early March, but higher than the 75% rate during SARS I.

The attempt to confine the impact of SARS to the SARS Alliance hospitals during SARS II appears to have insulated the non-Alliance hospitals from further large reductions in activity, but the non-Alliance hospitals were still unable to return to pre-SARS occupancy levels.

EXHIBIT 8.11

2003 GTA and Toronto Hospital Overall Acute Care Bed Occupancy by Hospital SARS Alliance Status by Week

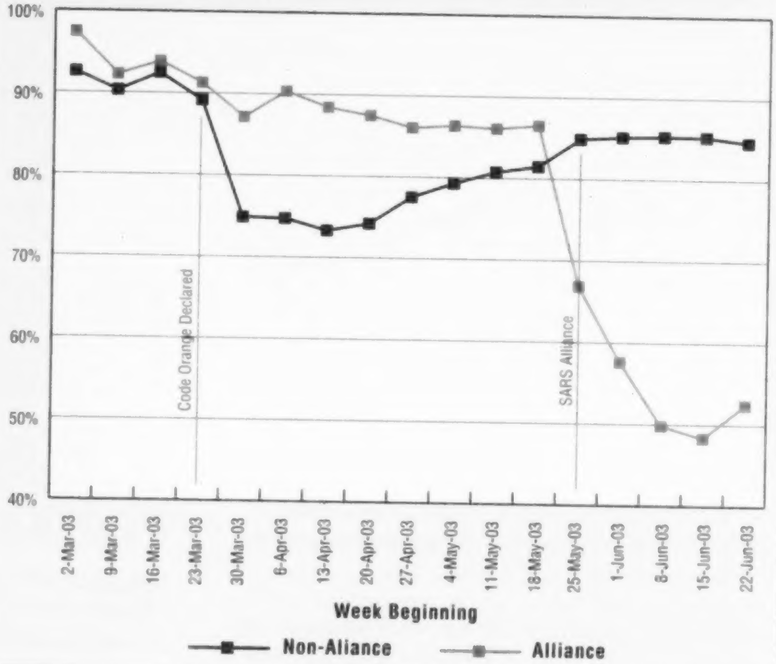
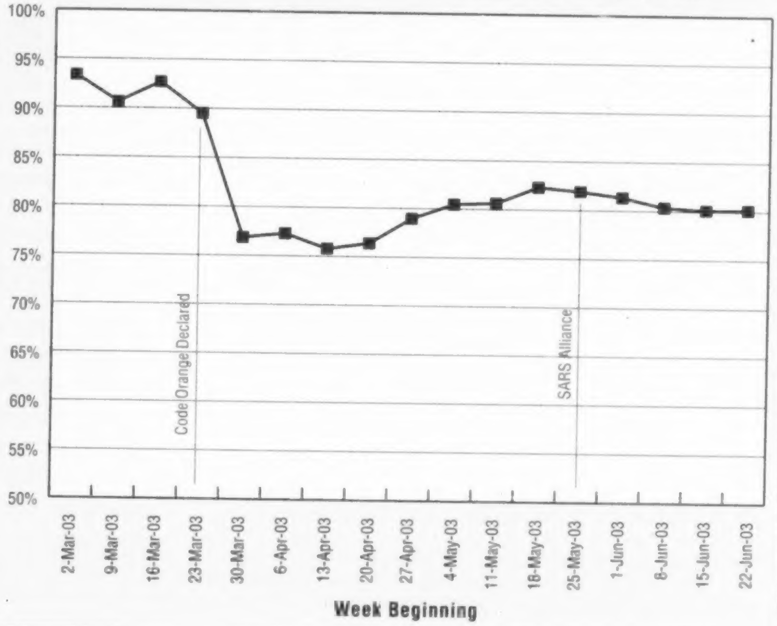


EXHIBIT 8.12

2003 GTA and Toronto Hospital Overall Acute Care Bed Occupancy by Week



8C.4 Elective Surgery Backlog

As noted, most medical admissions to acute care hospitals are non-elective and occur via the ED. The majority of surgical admissions are elective (as are almost all ambulatory procedures). This analysis of the service backlog in Toronto and GTA hospitals accordingly focuses on elective surgery cases (both ambulatory and inpatient).

If Toronto and GTA elective surgery activity in March, April, May, and June 2003 had been equal to the activity levels in the same months in 2002[7], then we estimate that there would have been 6,641 additional inpatient cases and 17,828 additional ambulatory procedure cases. More than half of the inpatient elective surgery backlog occurred in April 2003, during SARS I and Code Orange. The ambulatory procedure backlog was even more concentrated, with 85% occurring in April.

For purposes of calculating the cost to eliminate this backlog, we have assumed that all of the elective surgical cases that could not be accommodated during the SARS outbreak were deferred and will have to be accommodated some time in the future. It may not be necessary to address the entire backlog since:

- some patients may no longer require surgery (having opted for non-surgical treatment instead) or may no longer be suitable candidates for the surgery;
- some patients may have sought and received their care in hospitals outside Toronto and the GTA; and
- some physicians and patients may reassess the appropriateness of the planned surgery (given the restricted access), leading to removal of some patients from the waiting lists.

Using the 2001/02 CIHI/Hay Group annual benchmarking study data for Toronto and GTA hospitals, we established clinical program profiles for elective inpatient and ambulatory procedure activity. By applying average direct cost per weighted case values to the weighted case data, we estimated the direct cost of the deferred surgical activity to be $32.1 million.

The program areas with the estimated greatest backlog (in terms of cost) are:

- general surgery (including much of the cancer surgery, $6.3 million);
- orthopaedic surgery ($5.2 million); and
- cardio-thoracic ($5.2 million).

The analysis above is based on direct costs only. Some overhead costs (excluded from the direct cost calculation) could be considered to be partially variable, or at least affected by changes in direct care volume (e.g., laundry, housekeeping, materials management). If 50% of overhead costs were added to recognize variable overhead costs, the total estimate of the cost of deferrable surgical activity would increase from $32.1 million to $37.9 million. However, as explained above, it is unlikely that the entire calculated backlog will need to be cleared.

While this calculation focuses on deferred elective surgical activity, there will be various other backlogs, such as deferred elective medical admissions and deferred ambulatory diagnostic tests.

The OMHLTC has made $25 million available to hospitals for clearing deferred cases arising from the SARS outbreak. This funding will go some distance towards the estimated costs of the backlog, but not cover all estimated costs.

Funding will not be the only limiting factor on the capacity of the Toronto and GTA hospitals to further increase their activity levels to clear the backlogs. Other possible constraints include:

- hospital physical capacity (e.g., OR theatres, beds);
- staffing shortages (e.g., ICU nurses, respiratory therapists); and
- impact on efficiency and productivity of accommodating the post-SARS "new normal" practice in Ontario hospitals.

In addition, if overtime payments are required to ensure that staff is available to support the expanded activity, the unit costs per case will also be higher.

8D. Recommendations

A number of the issues raised by these interviews, focus groups, surveys, and analyses have already been addressed in earlier chapters, viz. strengthening public health infrastructure, better F/P/T coordination, clarity about outbreak management at a systems level, emergency preparedness and response and its relationship to health emergencies, surveillance, systems of alerts, and communication challenges. However, additional issues, many specific to health care and local/regional public health, also emerged. The Committee's members live, work, and pay taxes in several different provinces of Canada. Several of us are active as administrators and/or practitioners in the health field. As the tenor of the foregoing chapters has illustrated, we see our mandate as national, aiming at building all levels of public health collaboratively. We therefore have no hesitation in offering recommendations that bear on health care and local/provincial public health matters. Accordingly, the Committee recommends that:

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[7] We have assumed that without SARS, the 2003 activity levels would have been equal to the 2002 activity levels. This might not have been the case since some hospitals facing funding constraints may have planned to reduce activity anyway in 2003, while others were planning for increased activity consistent with program expansions arising from Health Service Restructuring Commission directives.

8.1 The CEOs of hospitals and health regions should ensure that there is a formal Regional Infectious Disease Network that can design and oversee implementation of hospital strategies for responding to outbreaks of infectious disease. These Networks should map out programs of hospital surveillance for infectious diseases that cross-link institutions and connect in turn to a national surveillance program so as to integrate hospital and community-based information.

8.2 As part of its activities, the F/P/T Network for Emergency Preparedness and Response should examine provincial and federal emergency measures with a view to ensuring that all emergency plans include a clear hierarchy of response mechanisms ranging from the response of a single ministry to a response from the entire government, with appropriate cross-linkages.

8.3 Provincial/territorial ministries and departments of health should ensure that emergency plans include provisions for appropriate compensation of those individuals required to respond to and those affected by the emergency.

8.4 Provincial/territorial ministries and departments of health should revise their statutes and regulations to require that every hospital or health region has formalized and updated protocols for outbreak management. These plans must include mechanisms for getting information and supplies to those outside the institutional sector, such as primary care physicians, ambulance personnel/paramedics, and community care providers.

8.5 The CEO of each hospital or health region should ensure that each hospital's protocol for outbreak management incorporates an understanding of the hospital's interrelationships with local and provincial public health authorities.

8.6 The CEO and relevant clinical chiefs of each hospital or health region should ensure that there is continuing education for hospital staff, particularly front-line health care workers, to enhance awareness of outbreak/infectious disease issues and institutional/clinical infection control.

8.7 Provincial/territorial ministries and departments of health should ensure that all key health leaders are trained in crisis communications. Hospital and health region CEOs in turn should ensure that clinical leaders and key administrators are also trained in crisis communications and that the organization has a clear cut protocol for providing all relevant information to staff and hearing their concerns in a timely, respectful, and participatory fashion.

8.8 Provincial/territorial ministries and departments of health should require through regulation and provide funding to ensure that emergency departments have the physical facilities to isolate, contain and manage incidents of infectious disease. Emergency departments should also be equipped with appropriate infostructure to enable their participation in infectious disease surveillance networks, including receipt of all necessary national and international alerts.

8.9 Provincial/territorial ministries and departments of health should provide the necessary funding for renovation to achieve minimal facility standards for infection control in emergency departments.

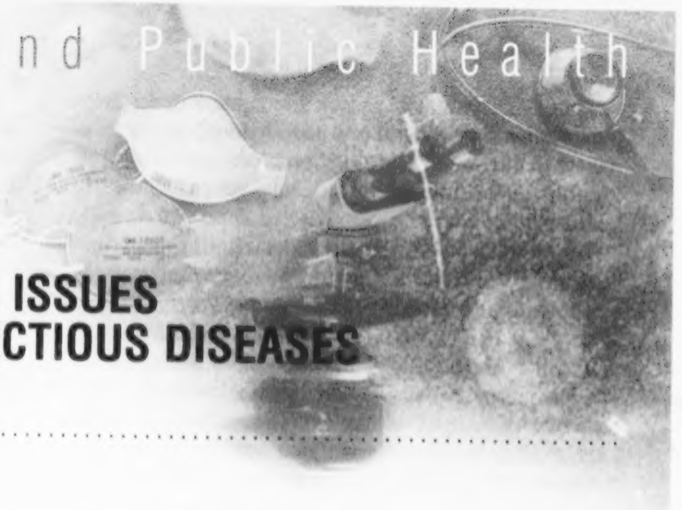
8.10 Provincial/territorial ministries and departments of health should ensure that each hospital has sufficient negative pressure rooms for treatment of patients with infectious disease.

8.11 Provincial/territorial ministries and departments of health should ensure that, for emergency situations, at least one hospital in each 'region' of a province/territory has sufficient facilities and other infrastructure to serve as a regional centre to anchor the response to outbreaks of infectious disease.

8.12 Provincial/territorial ministries and departments of health should ensure that systems are developed to ensure that providers and the public receive timely, accurate and consistent information and directives during an outbreak of infectious disease.

8.13 Public health managers and facility/regional health authority CEOs, in collaboration with relevant unions, professional associations and individuals, should create a process/mechanism to include front-line public health and health care workers in advance planning to prepare for related outbreaks of infectious diseases and other health emergencies. Occupational health and safety issues should be given prominence in this process.

8.14 Provincial/territorial ministries and departments of health should engage the Canadian Council for Health Services Accreditation to work with appropriate stakeholders to strengthen infection control standards, surveyor guidelines and tools that are applicable to emergency services as well as outbreak management within health care institutions. The standards should also include descriptors of the appropriate expertise required to maintain hospital infection control.



Chapter 9

SOME LEGAL AND ETHICAL ISSUES RAISED BY SARS AND INFECTIOUS DISEASES IN CANADA

The SARS outbreak and its aftermath have raised a number of legal and ethical issues. We begin with legal issues, as these are most germane to the Committee's mandate. A number of provider groups, such as the Canadian Healthcare Association, the Canadian Medical Association, and the Canadian Pharmacists Association, raised the need for specific legislative reforms. Indeed, the legal issues raised by SARS speak to the need for a thorough review of the broader constitutional and statutory framework governing infectious disease management in Canada. They include, among others: the efficacy of existing federal and provincial legislation governing responses to communicable disease outbreaks; the legal relationships between local and provincial public health officials; the constitutionality of mandatory isolation, quarantine, and treatment orders under both federal and provincial law in light of the *Canadian Charter of Rights and Freedom*'s guarantees for physical liberty and procedural fairness; workplace legislation and regulations as regards rights to refuse dangerous work and continuation of salary during quarantine or isolation; and the legal framework governing health information privacy under the *Charter*, provincial privacy and health information statutes, and other legislation governing the health sector. Although all of these issues require eventual attention, we focus here on a narrower set of questions.

First, we revisit, following from discussion in Chapters 3 and 4, some of the legal instruments available for the creation of a national infrastructure for the detection and management of infectious disease outbreaks. Second, a draft discussion document on federal legislation dealing with national health surveillance (the Canada Health Protection Act) has recently been circulated. We review the impact of this proposed legislation, and the impact of existing federal legislation (the *Privacy Act* and the *Personal Information Protection and Electronic Documents Act*) and proposed federal legislation on the creation of a national database for infectious disease surveillance and provider reporting. Next, we review aspects of existing public health legislation in three provinces (British Columbia, Ontario and Quebec) that deal with infectious disease outbreaks, and assess this legislation against the benchmark of the US Centers for Disease Control and Prevention's [CDC] Model State Emergency Health Powers Act. The last legal area for review is the matter of federal emergency legislation. The concluding section of the chapter returns to ethical issues and lessons learned from the SARS outbreak.

9A. General Legislative and Governance Issues

9A.1 *Legislation and Regulation as Components of the National Public Health Infrastructure*

In Chapter 4, we outlined the basic components of the public health infrastructure, indicating that an appropriate legislative and regulatory framework was essential to giving Canada a stronger capacity for coordinating and managing a response to outbreaks such as SARS. What exist now are separate systems within each of the provinces and territories, as well as a federal system that operates primarily at Canada's international borders. These systems are connected by a limited number of intergovernmental agreements, rather than through a systematic set of intergovernmental agreements oriented around an agreed strategic plan or through formal legal instruments that enable the systems to operate collectively and detect and address common challenges.

In legal terms, we are speaking of the need for rules of conduct (public health rules) that could guide the behaviour of all actors in the public health system—health care providers (e.g., physicians, nurses), health care institutions (e.g., hospitals, laboratories), public health officials from all levels of government (federal, provincial and local), and private individuals potentially subject to quarantine and isolation orders. With respect to surveillance, examples include rules governing the following: case identification (e.g., uniform criteria for diagnosis and laboratory testing), data sharing (e.g., timelines and procedures for reporting new cases and norms governing the protection of privacy), and information dissemination (e.g., responsibility for communicating to national and international audiences and the content of such communications). National public health rules are particularly important with respect to surveillance, because they facilitate the development of a real-time picture of the spread of infectious diseases at the national level.

Obviously, a national infrastructure also involves the creation of new federal and F/P/T *public health institutions*. These have already been outlined in previous chapters. In each case, considerable effort is needed to determine how these institutions will operate, and we have assumed in our budgetary thinking that this in itself will be a non-trivial albeit time-limited cost.

We reviewed in Chapter 4 the role of three policy instruments that operate on an interleaved basis—***grants***, ***contracts***, and ***intergovernmental agreements***. Given the critical nature of public health, and the need for genuine consistency and clarity about who does what, the Committee necessarily returns here to a fourth key policy instrument—legislation and regulation.

Again in simplified legal terms, the federal Parliament or a provincial legislature may (a) enact rules, or (b) delegate the power to make rules either to entities that are part of government (e.g., Cabinet, ministers of health) or arm's length from government (e.g., the Canadian Agency for Public Health, or the F/P/T Network for Communicable Disease Control). Rules enacted by legislatures take the form of legislation, whereas rules enacted by an authority exercising delegated powers take the form of regulations, by-laws, orders-in-council, etc. As an example, legislation could set out processes and authority for establishing a list of reportable and notifiable diseases, and regulations or by-laws could specify the current list of relevant diseases.

The advantage of legislation is that it governs the conduct of public officials and private institutions and individuals with or without their consent. But the limitation of legislation is first, that a legislature can only enact legislation in areas where it has jurisdiction, and second, that legislation represents a visible use of power by government with attendant political costs—particularly in a federation such as Canada where there have been tensions and centripetal forces over many decades. As noted in earlier chapters, the constitutional division of responsibility is not well-aligned with taxation authority in Canada, with the result that successive federal governments have used spending power instead of legislative authority in the health field.

Our recommendations thus far have followed this tradition. In effect, we are recommending that the federal government use grants as incentives for provinces, municipalities and health care providers to participate in a national infrastructure and infostructure (e.g., setting data standards regarding the timeliness and accuracy of information as conditions, agreeing to interoperability for outbreak surge capacity, sharing laboratory resources, etc.), without seeking to establish its jurisdiction over public health aspects of infectious disease management. This new flow of funds would be accompanied by structures to facilitate the attainment of F/P/T consensus and the creation of multiple intergovernmental agreements on the parameters of a renewed and seamless public health infrastructure. However, the Committee sees a continuing issue of governance and legislative authority that requires medium-term consideration.

9A.2 Governance Aspects

In theory, public health norms could be set by the federal government or by the new agency acting on the authority of Parliament. The legislation establishing the agency could set out a comprehensive set of public health norms, and/or delegate the enactment of public health norms to the Cabinet, the Minister of Health, or the new Canadian Agency for Public Health. The act would prevail over conflicting provincial public health legislation, unless challenged in the courts and struck down as unconstitutional.

An existing model for such an approach is the proposed *Assisted Human Reproduction Act*, Bill C-13. Bill C-13 would criminalize certain conduct (e.g., human cloning). It also would permit certain "controlled activities" (e.g., handling of sperm) to be performed only by licensed individuals, and/or at licensed facilities, in accordance with terms spelled out in regulations. The regulations would lay down how "controlled activities" could take place, effectively regulating the work of health professionals in connection with assisted human reproduction. Bill C-13 would also require licensees to report certain health information to a new federal agency, the Assisted Human Reproduction Agency of Canada, which would maintain a personal health information registry that could be used to administer and enforce the Act. Although there is provision in this scheme for provincial input, and for enforcement to be delegated to the provinces, the Agency would clearly be a federal agency.

A federal model would be the most efficient way to achieve national uniformity in national public health rules, but has drawbacks that we have already indicated. Unless its terms were closely aligned to the collaborative mechanisms set out elsewhere in this report, and unless it carried with it a funding mechanism, a federal model would run the risk of imposing unfunded federal mandates, and spark substantial opposition from provinces. From a policy standpoint, federal uniformity may come at the expense of provincial innovation and experimentation. The measures already set out in the Committee's report should allow the federal government and its provincial/territorial partners to stitch together existing uncoordinated local, provincial and federal public health systems into a national system, with attendant harmonization of existing provincial and local public health rules. A federally-imposed system might instead be viewed as a necessary last resort if collaborative and consensus-building mechanisms fail.

An alternative approach to creating system norms and rules would be for all levels of government to delegate powers to some new steering group. In this instance, public health norms could be set either by federal, provincial and territorial governments acting collectively, or by the new Canadian Agency for Public Health. Local public health authorities would remain in place to implement national public health norms. A weak scheme of F/P/T cooperation to these ends is in place at present, but it is largely informal.

How could this scheme be effected? As indicated in Chapter 4, the new agency would fund and facilitate the implementation of nationally-consistent norms as part of the implementation of various initiatives through the Public Health Partnerships Program. New funds for the National Immunization Strategy could flow to the same effect.

The F/P/T Network for Communicable Disease Control provides another vehicle, one with joint governance to facilitate urgent consensus-building in the realm of disease surveillance and outbreak management, where front line and provincial capacity is essential. It is theoretically possible but unlikely, that federal, provincial and territorial lawmakers would delegate powers to the network, which could then regulate both provincial and local public health responses. On the other hand, since the governance structure for the new network is based on F/P/T co-decision, our expectation is that the network will facilitate a process of harmonization of public health norms in federal, provincial and territorial legislation. In turn, that process could lead to legislative renewal and harmonization.

All these initiatives assume that provincial legislation would remain in place, and would be modified as necessary to comply with either federal conditions or, ideally, an emerging F/P/T consensus. They assume that neither Health Canada nor the new Canadian federal agency has legal authority to regulate provincial, territorial and local public health responses. And they assume, most importantly, that SARS has brought all F/P/T governments to a unanimous view that public health matters should be separated from other jurisdictional tensions, and regulated cooperatively.

The Committee accepts that all of these endeavours could be undermined if provinces and territories refuse to participate collaboratively. Hard decisions must be taken in the early days of the network, for example, as to whether the majority rules or whether a new norm must be adopted unanimously. As described in Chapter 5, an F/P/T process has been underway with respect to disease surveillance for many years, and has made only limited progress on a range of important issues. Accordingly, one might ask: What is the fall-back position if these new investments fail to secure progress?

In this regard, an obvious option is 'federal default'. "Default" public health norms would be set by the federal government, with advice from the new agency. Provincial rules would apply if they were "substantially similar" or "equivalent" to the national public health norms, thereby permitting provincial innovation and experimentation while ensuring national standards. The federal legislation would presumably include a list of notifiable diseases and terms for information sharing that would allow the federal government to meet its national as well as international obligations. Local public health authorities would remain in place to implement the national norms. Examples of federal legislation that set out a federal default position that does not apply in provinces with equivalent or substantially similar schemes include the *Tobacco Act*, the proposed *Assisted Human Reproduction Act*, the *Personal Information Protection and Electronic Documents Act*, and the *Canadian Environmental Protection Act*. The effect of this model is to permit provincial statutes to prevail over federal law in the event of overlap—a reversal of the norm whereby federal law prevails over provincial law in areas of overlapping jurisdiction. The courts have not considered the constitutionality of these provisions.

Federal default legislation charts a middle path that both ensures the creation of a national minimum and permits provincial variation. However, because the federal legislation would impose legal obligations on provincial and local public health officials, this strategy would still engender provincial/territorial opposition unless sufficient progress was made through the new funding mechanisms, strategies, and networks to permit the emergence of a consensus on 'template' provincial legislation and associated federal responsibilities that would be encompassed in the federal default provisions. On the other hand, if insufficient progress is made despite the investment of hundreds of millions of dollars, we believe Canadians would expect the federal government to get on with the task of creating a clearer framework for its own role and the corresponding default legislation for F/P/T interactions.

In all of this discussion, the question remains: Setting aside the various political and practical issues that have been given point above, does the federal government have a constitutional basis for legislating in the public health sphere?

9B. Jurisdictional Issues

9B.1 Background

As noted in Chapter 3, the Canadian Constitution's few explicit references to health-related matters grant *both* levels of government jurisdiction. The Constitution confers jurisdiction over "hospitals" and "asylums" on provinces, and jurisdiction over "quarantine" and "marine hospitals" on the federal government. Since the goal of the drafters of the Constitution in 1867 was to create two levels of government with non-overlapping areas of jurisdiction, these provisions can be interpreted as *dividing* jurisdiction over public health, with the provinces governing local public health matters, and the federal government attending to public health risks that arise at Canada's international borders (hence the references to quarantine and marine hospitals).

Over time, court decisions have placed many aspects of health care regulation within provincial jurisdiction. The courts have held that provinces possess jurisdiction over public health, including legislation for the prevention of the spread of communicable diseases, and sanitation. The provinces have exercised this jurisdiction to engage in health surveillance (including reporting and tracking), outbreak investigations, quarantine, isolation, and mandatory treatment. Moreover, the courts have granted provinces jurisdiction over a variety of related areas: drug addiction (including legislation for involuntary treatment), mental health (including legislation for involuntary committal), the medical profession (including the practice of medicine), workplace health and safety, the regulation of foods for health reasons, the safety and security of patients, and hospitals. The Supreme Court has stated that provinces enjoy jurisdiction over "health care in the province generally, including matters of cost and efficiency, the nature of the health care delivery system, and privatization of the provision of medical services," as well as "hospital insurance and medicare programs."

These areas of provincial jurisdiction are well-established. The central basis of provincial jurisdiction is the provincial power to regulate "property and civil rights". This power has been interpreted very broadly by the courts to encompass rights that individuals possess under the common law of tort (e.g., the right to bodily integrity, which is at issue in medical negligence, assault, and battery), contract, and property. Any public health law that infringes upon these common law rights falls within provincial jurisdiction.

Despite the broad powers of the provinces to regulate public health, federal involvement has also been clearly sanctioned by the courts. Indeed, the Supreme Court has said that "subjects related to 'health' do not exclusively come within either federal or provincial competence," and that "Parliament and the provincial legislatures may both validly legislate" with respect to health.

The firmest basis of federal jurisdiction over the management of infectious disease outbreaks is the federal power over "Criminal Law" although a good argument for federal jurisdiction can also be made on the basis of the federal power to legislate for the "Peace, Order, and Good Government" of Canada (the POGG power). To many, criminal law instruments—consisting traditionally of a criminal prohibition, police enforcement, prosecutions before the courts, and criminal sanctions—would appear to be unsuitable for the information-gathering and treatment goals that would underlie a national infrastructure for infectious disease surveillance. This harkens back to the eighteenth century concept of public health practitioners as the 'medical police', introduced in Chapter 3! The POGG power, which has been interpreted to permit the federal government to address issues with "national dimensions", appears to be a more appropriate vehicle for federal involvement. However, the importance of the criminal law power relative to federal jurisdiction is a function of Canada's constitutional history.

9B.2 Public Health and the Criminal Law Power

Although the Constitution assigns the federal government broad powers, such as the POGG power and the power to regulate "trade and commerce", most of these powers were historically interpreted extremely narrowly by the courts. By contrast, the federal criminal law power has been interpreted very broadly, and as a direct consequence, became the constitutional basis for a wide variety of federal legislation. Thus, the federal criminal law power is the constitutional basis for a wide range of statutes outside the traditional criminal law context, including the former *Combines Investigation Act*, the *Competition Act*, the *Canadian Environmental Protection Act*, and health legislation such as the *Food and Drugs Act*, the *Hazardous Products Act*, the *Tobacco Act*, and Bill C-13, the proposed *Assisted Human Reproduction Act*. The response of the Supreme Court to the federal government's extensive use of the criminal law power has been in many cases to extend its scope even further.

The focus of previous applications of the federal criminal law power to health-related issues has been on *products* that pose a risk to human health. However, through the criminal law power, Parliament has already regulated threats to human health posed by other *individuals* (e.g., the *Criminal Code* prohibitions on assault and murder). By analogy, Parliament might govern individuals who jeopardize human well-being because they have contracted an infectious disease.

The Supreme Court has stated that "[t]he scope of the federal power to create criminal legislation with respect to health matters is broad," and has laid down a three-part test for determining whether a federal law falls within the scope of the federal criminal law power: (a) Does the law prohibit an activity? (b) Are there penal consequences for contravening that prohibition? and (c) Is the prohibition motivated by a criminal law purpose?

Put another way, from a public policy standpoint, the principal limitation of the criminal law power is that it requires the creation of criminal offences. Criminal law offences are usually part of the traditional model of criminal law regulation, which consists of (a) prohibited conduct that is (b) clearly stated in statute, and (c) enforced through *ex post* criminal prosecutions, (d) before the criminal courts. This model is unsuitable for public health laws.

However, the Supreme Court has recently upheld under the criminal law power statutes that tie criminal prohibitions to extensive regulatory regimes, in the firearms and environmental protection contexts. These schemes are a far cry from the traditional model of criminal law, and may be designed to pre-empt the need for criminal prosecutions. An example of a criminal law statute regulating health care that contains an extensive regulatory regime is Bill C-13, the proposed *Assisted Human Reproduction Act* (discussed in more detail above).

Public health legislation, of course, has different goals than the traditional concerns of the criminal law. However, to be a criminal law, a law must be enacted for one of the following reasons: "public peace, order, security, health or morality." Public health laws are clearly enacted for a "health" purpose. Moreover, the Supreme Court has recently loosened up the test even further, now only requiring the law to have been enacted to further "fundamental values", a standard that a public health law would no doubt meet.

A potential advantage of predicating federal legislation on the criminal law power is that strictly intra-provincial activity may be regulated. In contrast, the national dimensions branch of the POGG power (discussed below) enables federal legislation to regulate interprovincial activity. The leading example here is the *Criminal Code* itself, which of course governs crime within any single province. The *Food and Drugs Act* and Bill C-13 also prohibit intra-provincial activity.

On the other hand, courts reviewing federal legislation will examine if it is a disguised attempt by the federal government to regulate areas of provincial jurisdiction (e.g., the practice of medicine). Thus, the legislation would need to be crafted with a view to avoiding those areas where the federal government has no claim to concurrent jurisdiction.

9B.3 Public Health and the POGG Power

Two branches of the federal government's Peace, Order and Good Government [POGG] power are relevant to public health and infectious diseases: (a) the "emergency" branch, which gives the federal Parliament jurisdiction to enact laws that would normally lie in provincial jurisdiction, on a temporary basis, in times of national crisis; and (b) the "national dimensions" branch, which gives the federal Parliament jurisdiction to enact laws in areas of concern to Canada as a whole.

The emergency branch of the POGG power sets aside the division of powers during emergencies, conferring "command-and-control" authority on the federal government. It is applicable to public health, since the courts have referred to epidemics and pestilence as health-related situations in which it could be invoked, but the threshold is very high, and therefore it has no applicability in most situations. More critically, the emergency branch of the POGG power can only be exercised for the duration of the emergency. Thus, the emergency branch of the POGG power could not serve as the constitutional basis of mandatory reporting for a national surveillance system and other components of a national public health infrastructure.

The national dimensions branch of the POGG power has intuitive appeal. It is what, in non-legal terms, most informants have invoked when speaking to the Committee of the legislative imperative facing Canada in the public health sphere. This branch of the POGG power has been used very infrequently by courts to uphold federal legislation, but holds potential as the basis for renewing federal public health regulation, particularly with respect to infectious disease management. The test for the national dimensions branch is (a) the area to be regulated must have a singleness, distinctiveness and indivisibility that clearly distinguishes it from matters of provincial concern; and (b) the area to be regulated must have a scale of impact on provincial jurisdiction that is reconcilable with the division of powers.

The courts have articulated a number of principles in interpreting the national dimensions branch of the POGG power that bear on potential public health legislation. The Supreme Court has invoked the idea of "provincial inability" that, taken literally, suggests that the POGG power permits the federal government to act where the provinces cannot. But the better view is that the POGG power permits the federal government to act alone in areas where provinces could conceivably legislate but are unwilling to do so. Two such situations are (a) inter-jurisdictional spillovers, and (b) federal-provincial collective action problems. Each of these potentially applies to infectious disease surveillance and outbreak management. A spillover is a situation where a province's failure to adequately regulate an activity has negative effects in other provinces, in federal territories, or in other countries. According to the Supreme Court, the federal Parliament can legislate if "provincial failure to deal effectively with the intra-provincial aspects of the matter *could* have an adverse effect on extra-provincial interests" (italics added). This requires little explanation in the context of SARS.

Collective action situations arise where (a) public policy problems straddle the divide between federal and provincial jurisdiction, and require a coordinated federal-provincial response, and (b) the cooperative scheme would be ineffective in every part of the country if one province were to decline to participate. Arguably, the ongoing failure of the federal government and the provinces to agree on a system of national surveillance (discussed in Chapter 5) is an example of just such a federal-provincial collective action problem.

The key limitation of the national dimensions branch of the POGG power is the need for the area to be regulated to be relatively narrow and confined, so as to not intrude too severely on provincial jurisdiction. This raises significant design issues for national public health legislation.

9B.4 The International Imperative

SARS has driven home the international dimension of infectious disease control and, in the view of the Committee's legal consultant, strengthens the constitutional case for a federal public health law under the national dimensions branch of POGG: the Supreme Court has held that where an international treaty stipulates that a policy matter straddles the divide between provincial and federal jurisdiction, the case for federal jurisdiction is much stronger. At present, international public health treaties that address infectious disease management are narrow in scope. The World Health Organization's [WHO] International Health Regulations impose a range of binding legal obligations on WHO member states to stem the international spread of infectious disease.

These International Health Regulations were under revision prior to SARS, and are being reviewed again in light of this outbreak. Draft proposals have not been released yet to the public. However, a WHO discussion document suggests that the revised International Health Regulations require member states to operate a national surveillance system:

> *Rapid identification of urgent national risks that may be public health emergencies of international concern would require that each country have a national surveillance system that feeds data from the periphery to the central governments in a very short time. ... Further, the system should be able to analyse such data rapidly and facilitate quick decisions.*

WHO's emphasis on the importance of accurate and comprehensive national data, collected on a real-time basis without regard to provincial boundaries, would serve to strengthen the claim of federal jurisdiction in Canada. Moreover, in another document, WHO proposes that the revised International Health Regulations lay down the following "minimum core requirements" for national surveillance systems. Timely, accurate and complete data are of central importance:

Detection and reporting: *Unusual and/or unexpected* disease events or public health risks in all communities shall be detected and all available *essential information* shall be immediately reported to the appropriate public health response level (e.g., emergency room, village health care worker, etc.).

Response - the first public health response level: The first level shall have the capacity to verify the reported event or risk and to begin implementing *preliminary* control measures immediately. Each event or risk shall be assessed immediately and if found urgent all available and essential information shall be immediately reported to the designated *national focal point.*

Response - national/international level: All reports of urgent events or risks shall be assessed at the national level within 24 hours. If the event/risk is assessed as meeting any of the following parameters for public health emergencies of international concern, WHO must be notified immediately through the national focal point:

- A serious and unusual or unexpected event.
- A significant risk of international spread.
- A significant risk of international travel and/or traffic restrictions on the free movement of persons, conveyances or trade goods.

WHO also stipulates that an additional design feature of national health surveillance systems should be a "single contact point" in a national health surveillance system to communicate information to WHO on a 24/7 basis. This international reporting structure would only reinforce the need for a national infrastructure in which all information is collected at a single point. Again, this supports the case for federal jurisdiction.

9B.5 Other Bases for Federal Legislation

The federal government enjoys jurisdiction over "Quarantine and the Establishment and Maintenance of Marine Hospitals." This power is the constitutional basis of the federal *Quarantine Act*. The scope of the power is unclear, as it has not been the subject of constitutional litigation. Originally, it was thought to be limited to maritime quarantine, given the juxtaposition of "quarantine" and "marine hospitals". Although the means for international travel have expanded, it is still thought to be confined to quarantine at entry into and exit from Canada. New regulations under the *Quarantine Act* have already been issued in response to SARS (see also Chapter 11). Whether this Act could be extended on the basis of interprovincial travel is unknown.

The final basis for federal jurisdiction over public health is its power to regulate trade and commerce. This provision gives the federal government the power to regulate interprovincial and international economic activity, up to and including the prohibition of interprovincial trade. Subject to the *Charter*, this might permit the federal government to ban the importation of items that carry infectious diseases (if diseases were carried by animals or produce, for example).

9B.6 The US Analogue

The Committee asked the CDC to advise on whether it had jurisdictional power to investigate an outbreak on its own cognizance, or whether CDC involvement occurs secondary to a request for assistance by a state or territory. We also asked what powers the US federal government has to become involved on its own cognizance, absent an invitation from the affected state or states. The CDC responded as follows:

"As a matter of policy, CDC generally requests state health department authorization to conduct activities within their borders. CDC requests this authorization whether the activity involves one state or several, whether CDC staff presence is actual or 'virtual', and whether the invitation to participate comes from within the state or from an outside agency or organization. This policy is based upon the Constitutional relationship between the federal and state governments. While states are reserved the 'police powers,' i.e., the authority of all state governments to enact laws and promote regulations to safeguard the health, safety, and welfare of its citizens within its borders, the federal government retains authority to regulate matters of interstate commerce."[1]

9B.7 Federal Legislation as Default

The early passage of a federal law that imposed unfunded obligations on the provinces and territories, or swept aside provincial authority over public health matters, would run counter to the collaborative framework that underpins our recommendations. The Committee's optimistic view is that if health surveillance and outbreak management were left to health professionals working in Health Canada and the provincial/territorial ministries of health, agreement would be reasonably rapid and comprehensive. Such issues can and should be insulated from the ebb and flow of F/P/T relations through the creation of the Canadian Agency for Public Health and the F/P/T Network for Communicable Disease Control.

The need for federal legislation could be vitiated not only by the piecemeal assembly of a system of national rules through mechanisms described, but by intergovernmental initiatives to upgrade and harmonize legislation. To that end, we believe the federal government should embark on a time-limited intergovernmental initiative with a view to renewal of the legislative framework for disease surveillance and outbreak management in Canada, ideally extending to broader health emergencies from the latter as a starting point.

Only if these initiatives fail to produce a national system of public health norms and rules would we recommend that the federal government move towards legislation along the lines of the 'federal default' provision set out above. Our assumption is that many provinces will be in agreement with the thrust of these legislative reforms and the goal of creating a national system, and that the default legislation would therefore apply only to those provinces that have not undertaken the necessary modernization and harmonization.

Our hesitation arises not just from a deep-seated (and perhaps naïve) belief in collaborative fiscal federalism, but also from two other observations.

First, outbreaks are fought at the local level. SARS was not contained by Health Canada; it was contained by local public health agencies and health care institutions. With our vast geography and cultural heterogeneity, Canada cannot be managed as regards infectious diseases like Hong Kong or Singapore.

Thus, a federal law may be ineffective if general and more harmful than helpful if unduly prescriptive.

Second, and as a corollary, we do not believe that the federal government could commandeer provincial and municipal public health officials to administer a federal public health statute. Politically, the concept of commandeering provincial and local public health officials to deliver federally-framed public policy without their consent strikes at the very idea of federalism. Federal laws do confer on provincial officials' broad grants of discretion, and/or grants of discretion subject to express criteria, and the Supreme Court has upheld federal laws employing both approaches. Here, however, we are considering a federal public health statute that would impose duties on provincial and local public health officials (e.g., a duty to share disease surveillance information with their counterparts in other provinces and with federal officials). The most obvious example of a federal statute imposing duties on provincial officials is the *Criminal Code*, which imposes an enormous number of such duties on provincial officials, ranging from the police and Crown Attorneys all the way up to provincial Attorneys General. Precedents for federal regulation imposing duties on provincial officials also exist outside the *Criminal Code*. In past provincial challenges to the constitutionality of federal laws, the imposition of duties on provincial officials was not itself an issue. Thus, this issue has not been squarely addressed by the Supreme Court. The overwhelming majority of arrangements for co-administration or co-management, however, have been established on a consensual basis, on the ground that provincial governments are not subordinate to the federal government.

9C. Existing and Proposed Federal Legislation

9C.1 The Proposed Canada Health Protection Act

Health Canada recently released proposals for a new Canada Health Protection Act. Health protection is currently governed by eleven federal statutes. Health Canada has deemed the existing scheme unsatisfactory on several grounds. The process of legislative revision has been underway since 1998. Public consultations will commence this Fall, ending at the earliest in December 2003, and may potentially extend until March 2004. Based on these consultations, Health Canada will draft legislation that will be ready for public distribution in 2005, at which point it would proceed through the legislative process.

The goal of the revision is to repeal and replace four statutes—the *Food and Drugs Act*, the *Hazardous Products Act*, the *Quarantine Act*, and the *Radiation Emitting Devices Act*—with a single statute, the Canada Health Protection Act.

The discussion document sets out procedures to deal with communicable diseases in relation to persons entering and exiting Canada, as well as relevant safeguards to ensure compliance with the *Charter of Rights and Freedoms*. Given the federal government's constitutional authority over interprovincial travel, the discussion document suggests that the provisions governing quarantine would also be applicable to movement across provincial and territorial boundaries in Canada, albeit with some modifications. However, the document does not advance any further claims to federal jurisdiction on this basis.

The discussion document also suggests that the Canada Health Protection Act "could articulate a role for the federal government to work with other public authorities inside and outside Canada to ensure a national framework for coordinated public health-related surveillance." More specifically, Health Canada could, "in cooperation with other interested parties," create a national health surveillance system. Health surveillance and research activities would include:

- developing, supporting and participating in national and international networks;
- promoting the use of standard techniques, analytical tools, models, definitions and protocols;
- ensuring surveillance of health events which include several jurisdictions;
- initiating programs to respond to emerging or priority issues;
- establishing, maintaining and operating information exchange systems; and
- undertaking national surveys.

The Act would authorize the Minister of Health to enter into agreements with provinces regarding these matters, including agreements regarding the delegation of enforcement powers to provincial officials.

Thus, the discussion document leaves intra-provincial public health regulation to existing provincial public health systems. The creation of a national infrastructure would be on a negotiated and cooperative basis, with intergovernmental relationships being governed by federal-provincial agreements. These agreements would be formal documents spelling out the terms of cooperation, which would be accessible to the public, and whose contents could be prescribed by legislation.

The measures suggested in the proposed Canada Health Protection Act to both formalize and make more transparent the intergovernmental approach to national surveillance are commendable. In particular, the provision for enforcement agreements between the federal and provincial governments would be a positive development. They are consistent with, and provide legal authority for, mechanisms such as those recommended in this report. Unfortunately, the document makes reference to neither an agency nor a network of the type proposed in Chapters 4 and 5. At the very least, the agency option might be given prominence for reasons already outlined.

9C.2 Federal Privacy Legislation and Public Health

Any national system of health surveillance would entail the collection of vast amounts of personal health information. As a consequence, it would potentially trigger the operation of privacy legislation governing both the private and public sectors.

PIPEDA: The ***Personal Information Privacy and Electronic Documents Act*** (PIPEDA) is a new law that regulates the collection, use and disclosure of "personal information" by a range of non-governmental entities, including corporations, associations, partnerships, trade unions, and private individuals. It is not clear where and how PIPEDA applies to health care providers. To the extent that PIPEDA does apply, provisions in the law appear designed to safeguard provider reporting obligations under federal and provincial law. However, PIPEDA may still impede surveillance because of its tight restrictions on the non-consensual collection of information. We elaborate below.

PIPEDA began to come into force on January 1, 2001, and currently only applies to the federally-regulated private sector (airlines, banking, broadcasting, etc.), as well as to interprovincial information transfers (e.g., communication of personal health information to private insurers from providers) and international information transfers. But it will apply to all entities that fall within its scope on January 1, 2004.

The basic rule of PIPEDA is the need for an individual to consent to the collection, use, and disclosure of her/his personal information. The principal target of PIPEDA is private enterprise. However, PIPEDA has generated controversy in the health sector because its definition of personal information includes "personal health information", which it defines as follows:

(a) information concerning the physical or mental health of the individual;

(b) information concerning any health service provided to the individual;

(c) information concerning the donation by the individual of any body part or any bodily substance of the individual or information derived from the testing or examination of a body part or bodily substance of the individual;

(d) information that is collected in the course of providing health services to the individual; or

(e) information that is collected incidentally to the provision of health services to the individual.

This extremely broad definition of health information covers any health information about an individual, however that information is acquired. Other information acquired incidentally in the provision of health services—e.g., an individual's name, address, or health card number—would also be covered.

If PIPEDA applies to the non-profit health sector, it potentially places into question the legality of a wide variety of existing or potential information-sharing practices. The Canadian Healthcare Association, for example, has argued that it might make difficult the measuring of outcomes and quality of care. The Canadian Pharmacists Association has suggested that PIPEDA could impede providers from submitting insurance claims on behalf of patients. Stakeholders have also suggested that the consent requirement could impede communication between members of a health care team treating a patient (Canadian Medical Association) or among different providers (Ontario Ministry of Health and Long-Term Care). The Canadian Institutes of Health Research has raised concerns that certain of PIPEDA's provisions would impose too onerous a burden on researchers.

These concerns suggest that PIPEDA was not drafted with sufficient attention to the particular issues facing the health sector. The Government of Canada has not clearly addressed these concerns in recent months—a situation that has done little to build confidence in the ability of the federal government to legislate prudently in the public health field. Major stakeholders have called for legislation that would apply to the health sector instead of PIPEDA, or regulations to PIPEDA to clarify its application to the health sector. These concerns are urgent, because the Act will soon be fully in force.

To these concerns we add the fact that PIPEDA may impede provider reporting in a system of infectious disease surveillance. These obstacles could arise not only with respect to any new reporting obligations imposed by federal legislation, but also in connection with *existing* reporting obligations under provincial legislation.

A fuller treatment of these issues can be found in the report prepared for the Committee by Prof. Choudhry. Three points suffice here. First, providers may be partly insulated by the fact that PIPEDA focuses on commercial activity, and the information at issue must be collected, used, or disclosed "in the course of" such activity. However, non-profit providers that enter into commercial contracts involving the transfer of personal health information (e.g., hospitals contracting with investor-owned laboratories and pharmacies) might trigger the operation of PIPEDA with respect to those relationships. Second, it appears that the form of the consent required under PIPEDA may vary, with sensitive information requiring express consent. PIPEDA specifically refers to "medical records" as sensitive information. Third, PIPEDA does allow for non-consensual disclosure if the disclosure is requested "for the purposes of enforcing any law of Canada, a province or a foreign jurisdiction" or "for the purpose of administering any law of Canada or a province." These exceptions would likely extend to reporting requirements under provincial or federal public health legislation provided those laws impose a reporting obligation. Non-consensual disclosure is also permitted "because of an emergency that threatens the life, health or security of an individual." This could apply to infectious disease reporting in an outbreak, but not in ordinary disease surveillance.

If a reporting obligation under existing provincial law conflicts with PIPEDA, PIPEDA would prevail. A province cannot "opt out" of PIPEDA unless the federal government concludes that it has enacted legislation that is "substantially similar" to PIPEDA. Because PIPEDA is not yet fully in force in the provinces, the question of how the federal government will approach the issue of whether provincial laws are substantially similar has not yet been considered. However, the Privacy Commissioner has interpreted "substantially similar" to mean that provincial legislation must provide protection for privacy that is "equal or superior" to that provided in PIPEDA.

In conclusion, PIPEDA could raise significant difficulties for collection of information for disease surveillance purposes under public health legislation, particularly under provincial legislation, and its impact on provider reporting of infectious diseases requires clarification.

***Privacy Act* and the proposed Canada Health Protection Act**. Once health information is passed on to a new federal agency, or the federal government, it might become subject to the federal *Privacy Act* or the proposed privacy measures set out in the Canada Health Protection Act draft discussion document.

Identifiable personal health information is information that identifies an individual or can reasonably be expected (through data linking) to identify him/her. This information is at issue in infectious disease surveillance. The proposed Canada Health Protection Act would grant Health Canada the power to collect identifiable personal health information. A national system of infectious disease surveillance centred either on Health Canada or an independent agency would similarly require a legislative basis for the collection of identifiable personal health information.

The proposed Canada Health Protection Act usefully sets out the principles that should govern the collection and use of identifiable information. *Informed consent* is the presumptive norm based on disclosure of the purposes for which the information is being collected. The non-consensual collection, use and disclosure of identifiable personal health information are subject to *necessity* riders. They are permitted if, and only if, (a) such non-consensual use is necessary in order to promote a legitimate public health objective, (b) the objective cannot be achieved with non-identifiable personal health information, and (c) the public interest in public health outweighs any harm to the particular individual(s) concerned. The collection, use and disclosure of identifiable personal health information must infringe upon privacy interests to the least extent required to achieve the public health objective. This *proportionality* principle has several dimensions: collecting or disclosing as little identifying information as is required in order to achieve the public health objective; conversion to de-identified data as soon as possible and limiting access to identifiable personal health information; prohibiting the use of identifiable personal health information to make decisions about an individual in other contexts (e.g., with respect to disability benefits, income tax credits, etc.); and taking precautions by those to whom Health Canada discloses information to prevent improper use or further disclosure for an unauthorized purpose.

The *Privacy Act* now in force does not fully satisfy these principles. As noted in Chapter 4, a new federal agency for public health would be subject to the Act if so designated through regulation. The consent provisions are weaker than those envisaged in the new act, and there is no specific test of necessity for the collection, use, or disclosure of personal information. Non-consensual disclosure is permitted "for the purpose for which the information was obtained ...or for use consistent with that purpose," or "for any purpose in accordance with any Act of Parliament or any regulation." Thus, the importance of the objective, the necessity of using identifiable information, and the weighing of the benefits obtained against the damage done to the individual are neither identified nor considered. The *Privacy Act* does not impose any legal obligation to use those measures which are the least invasive of privacy, such as de-identification, access on a need-to-know basis, etc.

The proposed Canada Health Protection Act discussion document also speaks to the issue of communication of identifiable personal health information between different governments. It suggests that Health Canada may collect and use such information provided to it by other governments without an individual's consent, when that information is provided by another government "performing a public health function", and if that other government was authorized by law to receive the information without consent in the first place. Non-consensual disclosure by Health Canada to other governments or public institutions would be permitted in a narrower range of circumstances—i.e., when consent would be impracticable or would defeat the legislative objective, and the public health interest would outweigh any prejudice to the individual.

The proposed federal act accordingly is contingent in some respects on the provincial laws surrounding privacy and health information. Inconsistencies in provincial legislation, in turn, will lead to variability in what is communicated to the federal government. It is these types of concerns that led the Advisory Council on Health Infostructure to call in its *Final Report* (1999) for the harmonization of provincial and federal privacy legislation.

9C.3 Summary

Two key pieces of federal privacy legislation fall on either side of a divide. One is too sweeping and restrictive, while the other does not conform to protective principles that have been articulated in the proposed Canada Health Protection Act. Federal privacy legislation must be amended to properly accommodate a national system of infectious disease surveillance. It is not clear if PIPEDA applies to health care providers. To the extent that PIPEDA does apply, it threatens to undermine provider reporting obligations under federal and provincial law, because of its tight restrictions on the non-consensual collection of information. The impediments posed by PIPEDA to federal reporting obligations could be easily handled through appropriate statutory language. However, if applicable, PIPEDA would prevail over provincial public health statutes. Moreover, provinces do not have the ability to "opt out". The potential difficulties posed by PIPEDA to public health and disease surveillance are part of a larger set of concerns regarding PIPEDA's application to the health sector. PIPEDA's application to the health sector requires an urgent review, culminating either in separate federal health information privacy legislation, or amendments to PIPEDA.

On the other hand, the non-consensual collection, use and disclosure of identifiable personal health information by the federal government, or by federally-created agencies, should comply with the principles of necessity and proportionality. The *Privacy Act* falls short of those principles. The proposed Canada Health Protection Act would comply with those principles, except with respect to the treatment of data communicated to the federal government by the provinces where the inconsistencies in provincial privacy legislation lead to concerns.

On both counts, then, as Canada moves to implement a stronger national system of disease surveillance, federal legislation dealing with health information privacy must be reviewed and either amended or its applicability clarified.

9D. Provincial Legislation on Infectious Disease Outbreaks

9D.1 Background

A large number of statutes and regulations set out the legal framework within which provincial public officials, health care professionals, and private individuals operate to manage disease outbreaks. In the wake of SARS, one question that must be asked is whether this legal framework provides public health officials with the tools to tackle infectious disease outbreaks, while at the same time respecting the rights to privacy and physical liberty of persons subject to public health legislation.

A recent report prepared for Health Canada entitled "A Compendium of the Canadian Legislative Framework for the Declaration and Management of Infectious Diseases" collects and summarizes the relevant provisions under various provincial laws. The Committee asked Prof. Choudhry to measure the public health legislation of British Columbia, Ontario and Quebec against the CDC's Model State Emergency Health Powers Act. Although the Model Act may itself contain deficiencies, it was a potential benchmark and springboard for analysis.

9D.2 The Model State Emergency Health Powers Act

The CDC recently released a Model State Emergency Health Powers Act that provides a template for state legislatures to use in modernizing and updating their public health legislation. The Model Act was formulated as part of a broader attempt to examine public health infrastructure in the United States in the wake of the terrorist attacks of September 11, 2001. Even prior to September 11, a leading academic study had concluded that state public health laws were badly in need of revision, because they did not reflect contemporary understandings of disease surveillance, prevention and response; did not accord sufficient weight to individual privacy and liberty; were often fragmented (with multiple laws in place within states applying different norms to different diseases); and did not require planning in advance of public health emergencies (including mechanisms for communication and coordination within and between states, and the clear allocation of responsibilities).

The legal consultant's review focused on provisions in the Model Act dealing with disease reporting and information sharing with other jurisdictions. The relevant provisions are summarized below.

- *Who Must Report:* The Model Act imposes reporting obligations on "health care providers", which includes both institutions (hospitals, medical clinics and offices, special care facilities, medical laboratories) and persons (physicians, pharmacists, dentists, physician assistants, nurse practitioners, registered and other nurses, paramedics, emergency medical or laboratory technicians, and ambulance and emergency medical workers) that provide health care services. The definition is non-exhaustive—i.e., it could apply to other individuals and institutions not listed in the Model Act who provide health care services. Coroners and medical examiners also owe reporting obligations.

- *Triggering Event For Report:* Reporting must take place in "all cases of persons who harbor any illness or health condition that may be potential causes of a public health emergency." The Model Act does not require that the person suffer from the illness, and therefore may include persons who have merely been exposed to or infected with an illness. However, the Model Act does require that the person actually harbor the illness; a "reasonable suspicion" or the prospect that the person "may" harbor the illness do not appear to be sufficient.
- *Reportable Diseases:* The reporting obligation extends to "any illness or health condition that may be potential causes of a public health emergency." Reportable diseases include, but are not limited to, a list of biotoxins issued by the US federal government, and any illnesses or health conditions designated by state public health authorities. A public health emergency—a key concept in the Model Act—is defined as follows:

  > an occurrence or imminent threat of an illness or health condition that:
  >
  > (1) is believed to be caused by any of the following:
  > (i) bioterrorism; (N.B.: bioterrorism is also defined);
  > (ii) the appearance of a novel or previously controlled or eradicated infectious agent or biological toxin;
  > (iii) a natural disaster;
  > (iv) a chemical attack or accidental release; or
  > (v) a nuclear attack or accident; and
  >
  > (2) poses a high probability of any of the following harms:
  > (i) a large number of deaths in the affected population;
  > (ii) a large number of serious or long-term disabilities in the affected population; or
  > (iii) widespread exposure to an infectious or toxic agent that poses a significant risk of substantial harm to a large number of people in the affected population.

- *When Report Must Be Made:* The report must be made within 24 hours.
- *To Whom Report Must Be Made:* The report must be made to "the public health authority", which is the state public health authority or any local public health authority.
- *What Information Must be Reported:* The report must include: the specific illness or condition; the name, date of birth, sex, race, occupation, and home and work addresses of the patient; the name and address of the person making the report, and any other information required to locate the patient for follow-up.
- *Information Sharing with Other Jurisdictions:* The Model Act requires a state public authority to notify federal authorities if it "learns of a case of a reportable illness or health condition, an unusual cluster, or a suspicious event that may be the cause of a public health emergency." The scope of the information that is shared is limited by a test of necessity—that is, it must be "information necessary for the treatment, control, investigation and prevention of a public health emergency."

9D.3 Initial Assessment of Provincial Laws in light of the Model Act

We review below the differences observed between the Model Act and the public health laws of British Columbia, Ontario, and Quebec.

Who must report: The Model Act imposes reporting obligations on a wide range of individuals and institutions within the health sector. Legislation in British Columbia, Ontario and Quebec generally follows this pattern, albeit through slightly different means. Ontario's legislation is most similar to the Model Act, in that it exhaustively enumerates who is under a reporting obligation. British Columbia, by contrast, imposes a duty on "any person". While this latter provision has the benefit of flexibility and adaptability to an ever-changing landscape of institutional and individual providers, it comes at the expense of clarity and accountability. Quebec's law (which was recently enacted) raises a different sort of concern—the only health professionals with reporting obligations are physicians. Nurses and other health professionals who might be the first to identify a case of infection appear to owe no reporting obligation. As well, hospital administrators do not appear to be under a duty to report, notwithstanding their overall responsibility for the institutions which they manage.

Triggering Event: The triggering event for the reporting obligation under the Model Act is that a person "harbor" an illness, which includes persons who have been infected with and who suffer from the illness. In British Columbia, only physicians are obliged to report cases of infection; other reporting obligations apply if an individual is suffering from or has died from a communicable disease. It would appear that other health care providers need not report instances of infection. Similarly, in Ontario, only physicians and hospital administrators appear to be under an obligation to report instances of infection. Laboratories might be required to report instances of infection, depending on the information yielded by a test. Quebec's broad language, requiring reporting in the case of a suspicion "of a threat to the health of the population" would presumably extend to infections.

List of Reportable Diseases: The Model Act is written against the backdrop of September 11, 2001 and, as a consequence, is focused on public health emergencies, particularly those arising from bioterrorism. In this respect, it is not a good model for a general purpose public health statute. British Columbia, Ontario and Quebec appear to require the reporting of largely similar diseases vis-à-vis one another. One problem is that triggering events are sometimes undefined. For example, in Ontario a "communicable disease outbreak" is undefined, as is a "disease outbreak or occurrence" in British Columbia. Although the lack of definition promotes flexibility, the lack of clear definition might lead to over- or under-reporting.

When Report Must Be Made: The Model Act requires reporting within 24 hours, presumably because of its focus on emergent biological threats. Within British Columbia, there are specific reporting obligations ranging from 24 hours to 7 days. Quebec has a uniform, province-wide standard of 48 hours. Ontario and Quebec both use imprecise language, such as "as soon as possible" and "promptly", which impedes clarity and accountability.

To Whom Report Must be Made: The Model Act requires that all reports be made to the state public health authority, to facilitate data centralization. The overwhelming majority of reporting obligations in British Columbia, Ontario and Quebec require information to be sent to the medical officer of health (British Columbia, Ontario) or the public health director (Quebec). As a consequence, public health laws in these provinces also facilitate data centralization.

What Information Must be Reported: All three provincial acts provide reasonably detailed delineation of what must be reported.

Duty to Share Information with Other Jurisdictions: The Model Act requires that federal officials be notified in the event of a public health emergency. Although provincial laws govern non-emergency situations, they nonetheless should contain some obligation on the part of provincial officials to report information to their provincial and federal counterparts. According to the information contained in "A Compendium of the Canadian Legislative Framework for the Declaration and Management of Infectious Diseases," no such obligations exist. This does not mean that such communications do not occur in practice.

In conclusion, provincial public health laws measure up reasonably well against the CDC state template. Some variation is probably attributable to the emergent focus of the Model Act. However, some standardization across provinces with respect to timelines and legal obligations to share data with federal and provincial counterparts should be considered in the context of the intergovernmental review of public health legislation recommended above.

9E. Federal Health Emergencies

Chapter 5 alluded to the federal *Emergency Preparedness Act* (R.S. 1985, c. 6 (4th Supp.)) proclaimed in 1988. That legislation delineates wide-ranging obligations on ministers to ensure that their departments take action to "develop policies and programs for achieving an appropriate state of national civil preparedness for emergencies." It also specifies a responsibility for liaison with provinces and a coordinating role for the federal government. Its design dovetails with the federal *Emergencies Act* (R.S. 1985, c. 22 (4th Supp.) that received assent in 1989 and replaced the problematic *War Measures Act*.

The *Emergencies Act* describes various categories of emergencies. The most salient is the subcategory of public welfare emergency that includes "an emergency that is caused by a real or imminent...disease in human beings, animals or plants...that results or may result in a danger to life or property, social disruption or a breakdown in the flow of essential goods, services or resources, so serious as to be a national emergency." It defines a "national emergency", in turn, as "an urgent and critical situation ... that seriously endangers the lives, health or safety of Canadians and is of such proportions as to exceed the capacity or authority of a province to deal with it."

The federal government's effectiveness in coordinating health emergencies on a national basis is arguably compromised by the lack of specific legislation. During a truly national health emergency, Health Canada has two vastly different options for asserting a 'command-and-control' function necessary for a national response. Officials refer to these with some frustration as 'the sledgehammer' and the 'tackhammer'. The former option, implementation of the *Emergencies Act*, can only be invoked if a high threshold is crossed as noted above. The *Emergencies Act* confers very wide powers on the federal government and has not been invoked since its passage. The latter option essentially involves "requesting" collaboration from public health partners.

The Canadian Medical Association has argued in a detailed submission that emergency managers require a public health legislative platform that lies between these two extremes and facilitates a coordinated response at all levels of government for public health emergencies. They propose a specific 'Health Emergencies Act' with graded increases in federal responsibility and jurisdiction as the scope and scale of an emergency spreads. Based on their brief and a confidential technical document, the Committee infers that the proposal involves provincial/territorial consultation at every stage and provincial/territorial consent for a claim of jurisdiction only for lower level health emergencies. The Committee agrees with some informants who have suggested that the threshold for non-consensual federal jurisdiction in the Canadian Medical Association scheme should be shifted 'upwards', but this modification does not invalidate the underlying concept.

As the level of government uniquely charged with protecting the national interest, the federal government has the strongest legitimacy to act alone when an infectious disease outbreak potentially has interprovincial and/or international dimensions. Moreover, it enjoys a comparative institutional advantage in regulating matters with an interprovincial or international dimension. Conversely, provincial public health officials enjoy the greatest legitimacy in responding to outbreaks that are largely local in impact. A graded approach to federal intervention would complement, rather than replace, existing provincial, territorial and municipal public health structures, helping again to stitch them together into a national system.

Earlier in this chapter, we signaled our discomfort with the idea that a federally-appointed public health official could commandeer provincial/territorial and local public health officials for matters such as disease surveillance. However, in a public health emergency, where such powers would be exercised only temporarily and then only after an assessment that the gravity of the situation posed a clear danger to the health of Canadians that could not otherwise be managed, the basis for those objections is blunted.

As currently proposed, the Canada Health Protection Act does not include any discussion of health emergencies. In part, this is because the proposed act adheres to a fairly narrow understanding of federal jurisdiction, i.e., jurisdiction over international and interprovincial movement of persons, whereas public health emergencies might encompass a broader range of circumstances. The Canadian Medical Association proposal allows for movement into provincial jurisdiction by the federal government in the event of a truly grave emergency. The constitutional basis for federal emergencies legislation would be the emergency branch of the POGG powers.

The Committee believes that the Canadian Medical Association proposal has merit and recommends that, as part of the legislative renewal process already underway, two steps be taken. First, the intergovernmental initiative in public health legislation should consider extant emergency legislation in the light of public health emergencies with a view to harmonization as appropriate across provinces and territories. Second, consideration should be given to a federal health emergencies act to be activated in lockstep with provincial emergency acts in the event of a pan-Canadian health emergency. We leave to the relevant experts whether this falls under the proposed Canada Health Protection Act, under legislation to establish the new Canadian Agency for Public Health, both, or a separate legislative initiative.

9F. Ethical Issues and Lessons from the SARS Outbreak

The SARS outbreak posed a number of ethical challenges. Decision makers were required to balance individual freedoms against the common good, fear for personal safety against the duty to treat the sick, and economic losses against the need to contain the spread of a deadly disease. Decisions were often made with limited information and under short deadlines.

A working group of the University of Toronto Joint Centre for Bioethics undertook to draw the ethical lessons from the challenges of and responses to SARS in Toronto[2]. The working group identified five general categories of ethical issues arising from the SARS experience:

- Public health versus civil liberties: There are times when the interests of protecting public health override some individual rights, such as the freedom of movement. In public health, this takes its most extreme form with involuntary commitment to quarantine.
- Privacy of information and the public's need to know: While the individual has a right to privacy, the state may temporarily suspend this privacy right in case of serious public health risks, when revealing private medical information would help protect public health.
- Duty of care: Health care professionals have a duty to care for the sick while minimizing the possibility of transmitting diseases to the uninfected. Institutions in turn have a reciprocal duty to support and protect health care workers to help them cope with the situation, and to recognize their contributions.
- The problem of collateral damage: Restrictions on entry to SARS-affected hospitals meant that people were denied medical care, sometimes for severe illnesses. There were also restrictions on visits to patients in SARS-affected hospitals. Decision makers faced duties of equity and proportionality in making decisions that weighed the potential harm from these restrictions against benefits from containment of the spread of SARS through rapid and definitive intervention.
- Global interdependence: SARS underlines the increasing risk of emerging diseases and their rapid spread. It points to a duty to strengthen the global health system in the interests of all nations.

The Joint Centre working group suggests that an ethical framework be developed that would address the five issues noted above, and that would ensure that Canada is better prepared to deal with future health crises involving highly contagious diseases.

Four of these points bear brief elaboration.

Civil Liberties: During both SARS outbreaks, health care practitioners, patients and families were asked to place themselves under ten-day quarantines in their homes in order to reduce the risk of exposure of an infectious disease to the community. Other strategies used during SARS were widespread availability of disposable masks, self-surveillance and work-home quarantine (i.e., limiting contacts to those necessary for duties in the health care setting), and restrictions on assembly of groups. Although the *Health Protection and Promotion Act*[3] gives officials the power to force non-compliant individuals into quarantine, this was used only once during the outbreak.

Applying the principle of reciprocity, society has a duty to provide support and other alternatives to those whose rights have been infringed under quarantine. Intriguingly, after returning from quarantines, some health care practitioners reported feeling disconnected from the current state of the organization[4]. Focus groups with front-line workers also revealed that some in quarantine wished to continue participating in the battle against SARS by contacting patients and families to provide support and answer questions, or by helping with contact tracing.

Privacy: Disease reporting during an outbreak carries the risk of a breach of confidentiality. Boundaries of privacy vary from person to person. Some believe that there is a risk of privacy infringement only if confidentiality is not maintained and a social stigma or loss of employment ensues from the breach. The other view is that a privacy infringement is wrong regardless of whether any harm occurs as a result[5]. In either event, under the ethical value of proportionality, officials must use the least intrusive method to obtain their goal. Legislation such as the *Health Protection and Promotion Act* prohibits the release of personal information except in very specific circumstances where there is a public good to be served or added protection obtained by releasing an individual's name.

During SARS, Toronto Public Health named only two names—that of the deceased index case for Toronto and her deceased son, and this was done with the informed consent of the surviving family members, based on their understanding that this extraordinary step was necessary for the protection of public health. An unknown number of people had attended a funeral visitation at the home of the deceased index case, and public health authorities had no way of contacting these people individually to advise them that they had been exposed and to watch for symptoms and remain in isolation for ten days. Most of the remaining family members were already hospitalized and too ill to provide sufficient detail. Two probable SARS cases identified themselves to Toronto Public Health as a direct result of this announcement. Both were health care workers who could have spread the virus further with disastrous results. These details illustrate the knife-edge on which these decisions rest.

Duty of care: Health care providers constantly weighed serious health risks to themselves and their families against their obligation to care for patients with SARS. A substantial percentage of the probable SARS cases involved front-line providers. Nurses and physicians were at particular risk. Overall, it appears that 168 people or about 40% of those infected were health care workers. The Canadian Medical Association Code of Ethics calls on physicians to "consider first the well-being of the patient[6]," while the Canadian Nurses Association Code of Ethics for nursing stipulates that "nurses must provide care first and foremost toward the health and well-being of the person, family or community in their care[7]." Other health care professions in Canada have considered or adopted similar codes. SARS has taught us, however, that this ethical duty must be balanced by a countervailing duty: not to place others at risk by coming to work while ill and potentially contagious. What remains unclear are the limits to this duty: What is the point at which the duty of care is balanced by a right to refuse dangerous tasks? How is the duty of care modified by the occupational circumstances and professional obligations of different health care workers?

Just as health care practitioners have a duty to care for the sick, health care organizations clearly have a reciprocal duty to support and protect their workers. This meant providing the necessary safety equipment and appropriate education regarding the use of such equipment, providing information on risks and the need for precautionary measures and ensuring a safe working environment. Notwithstanding the enormous efforts that many institutions made with respect to internal communication and safeguards for health care workers, serious tensions arose with respect to occupational health and safety. Many of these were avoidable, as they arose from directives around N95 masks and fit-testing which were either more stringent or interpreted more stringently, than necessary. Health care organizations did offer a variety of psychological supports to their staff, but many of these measures were instituted after SARS, rather than during the outbreak itself. What also emerged very clearly was that health care workers under siege in an emergency such as SARS greatly valued and deserved strong support from community and political leaders as well as co-workers and administrators.

Collateral effects: The ethical trade-offs posed by the collateral effects of caring for SARS patients were numerous. For example, the Catholic Health Association of Canada noted in its submission the serious impact on many patients, friends, and families from restricted visiting hours. Decision making was particularly challenging in critical care units[8]. The principle of equity required that decision makers balance controlling the spread of the disease on the one hand, and the rights of non-infected patients to access medical care, particularly urgent services on the other. The enormous human toll of the disruption to the system lies just beneath the statistics in Chapter 8. Countervailing this impact is the very real likelihood that the uncontained spread of SARS could have killed thousands. Such trade-offs make it very difficult to apply any ethical Procrustean bed in hindsight to the decisions made. However, an ethical framework of some type may be useful for future decision makers.

To this list the Committee would add two other issues.

First, the Canadian Association of Medical Microbiologists has noted the ethical challenges that arose in undertaking research during the SARS outbreak. Issues arose that cut across individual institutions and agencies, necessitating unprecedented coordination of expedited ethical reviews of research protocols and outbreak investigation proposals.

Second, scientific credit and collaboration also pose ethical challenges during an outbreak. For example, while many academic clinicians were fighting the SARS outbreak in Toronto, research scientists were testing the samples that were flooding the National Microbiology Laboratory in Winnipeg. They collaborated with the British Columbia Centre for Disease Control and genomics experts salaried by the British Columbia Cancer Agency to sequence the Toronto strain of the coronavirus. The University of British Columbia subsequently purchased a full-page advertisement during the outbreak to claim credit for the discovery. We thus had the situation where some academics were fighting a battle for all of Canada against a new infectious agent, and others were consumed with offering scientific advice to bring the outbreak under control, while others capitalized brilliantly on the availability of specimens and data to the benefit of all, winning scientific kudos in the process. How does one apportion a fair distribution of scientific credit in these difficult circumstances? Guidelines are needed to facilitate collaborative research and research publications during infectious disease outbreaks, particularly in a relatively small academic community such as that which exists in Canada.

A related ethical issue that arose from SARS is the seeking of patents on the SARS-associated coronavirus. Researchers in the United States, Canada and Hong Kong[9] have applied for patents on the coronavirus and its gene sequence. The US CDC and the British Columbia Cancer Agency publicly acknowledged taking this course of action to ensure that the virus and the sequence remain in the public domain (it is important to note that the sequences were published in *Science* magazine in early May, 2003)[10]. A news item in the June 20, 2003 edition of *The Lancet* reported that the US National Institute of Allergy and Infectious Diseases is making a SARS genome "chip" available to researchers around the world, free of charge, in an effort to spur research. The "chip" contains the 29,700 DNA base pairs of the SARS coronavirus designed from data from institutes in the US, Canada, and Asia that had sequenced the complete SARS coronavirus genome.

While this is a positive development, the patenting of organisms and genes such as SARS remains an issue and has raised myriad concerns[11,12]. The current patent system in Canada was not designed to address questions of DNA patenting and the commercialization of the human genome. Generally, raw products of nature are not patentable. However, a patent may be granted to the entire process of discovering and isolating, in the laboratory, strings of DNA that were not obvious before, rather than to a gene as it exists in nature. In order to patent a gene, a sequence or other similar material, the inventor must modify or identify the novel genetic sequences. The product of the sequence must be modified and the function in nature must be explained. These matters have been given point in Canada by the narrow decision (5-4) of the Supreme Court, in December 2002, to reject the patent of the Harvard 'Onco-mouse', not because of any primary principled objection to the concept, but because extant Canadian patent legislation did not contemplate such a claim. Patents had previously been granted in Canada for unicellular organisms; thus, there is ample precedent in Canada for patenting the genome of a virus. However, the ramifications of these practices are important, particularly where public funding or public health issues are concerned. This issue falls outside the Committee's mandate, but underscores the continuing uncertainty and concerns from a number of quarters about the patenting of organisms and genes in general. The Committee urges continued vigilance and debate concerning the application of the *Patent Act* and the corresponding frameworks surrounding the patent process to the unique challenges of patenting micro-organisms and other living entities.

9G. Recommendations

In light of the foregoing issues, the Committee recommends that:

9.1 The Government of Canada should embark on a time-limited intergovernmental initiative with a view to renewing the legislative framework for disease surveillance and outbreak management in Canada, as well as harmonizing emergency legislation as it bears on public health emergencies.

9.2 In the event that a coordinated system of rules for infectious disease surveillance and outbreak management cannot be established by the combined effects of the F/P/T Network for Communicable Disease Control, the Public Health Partnerships Program, and the above-referenced intergovernmental legislative review, the Government of Canada should initiate the drafting of default legislation to set up such a system of rules, clarifying F/P/T interactions as regards public health matters with specific reference to infectious diseases.

9.3 As part of Health Canada's legislative renewal process currently underway, the Government of Canada should consider incorporating in legislation a mechanism for dealing with health emergencies which would be activated in lockstep with provincial emergency acts in the event of a pan-Canadian health emergency.

9.4 The Government of Canada should launch an urgent and comprehensive review of the application of the *Protection of Information Privacy and Electronic Documents Act* to the health sector, with a view to setting out regulations that would clarify the applicability of this new law to the health sector, and/or creating new privacy legislation specific to health matters.

9.5 The Government of Canada should launch a comprehensive review of the treatment of personal health information under the *Privacy Act*, with a view to setting out regulations or legislation specific to the health sector.

9.6 The Canadian Agency for Public Health should create a Public Health Ethics Working Group to develop an ethical framework to guide public health systems and health care organizations during emergency public health situations such as infectious disease outbreaks. In addition to the usual ethical issues, the Working Group should develop guidelines for collaboration and co-authorship with fair apportioning of authorship and related credit to academic participants in outbreak investigation and related research, and develop templates for expedited ethics reviews of applied research protocols in the face of outbreaks and similar public health emergencies.

9.7 F/P/T departments/ministries of health should facilitate a dialogue with health care workers, their unions/associations, professional regulatory bodies, experts in employment law and ethics, and other pertinent government departments/ministries concerning duties of care toward persons with contagious illnesses and countervailing rights to refuse dangerous duties in health care settings.

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Chapter 10

EMERGING INFECTIOUS DISEASE RESEARCH IN CANADA – Lessons from SARS

The Canadian experience with SARS reminds us that the investigation of an epidemic is research—research conducted at a feverish pace. Chapter 5 outlined how the research conducted during an outbreak is essential to effective response measures and ultimate control of the epidemic. Unfortunately, with a few notable exceptions, Canadian governments and public health institutions did not heed the warnings of the 1994 Lac Tremblant declaration and build the necessary research capacity for emerging infectious diseases. Research and evaluative capacity in public health more generally was not sustained during the budget roll-backs of the 1990s, as deficit-cutting reductions in federal transfers limited provincial and municipal spending.

A more fundamental problem, however, is one of culture and commitment. Quebec's National Institute of Public Health and the British Columbia Centre for Disease Control [BC CDC] have supported research, and Health Canada's realignment in 2000 provided tangible support for in-house science capacity. However, the Committee perceives that public health agencies and governments have often regarded research capacity as academic, irrelevant, and discretionary rather than the core public health function that it is. F/P/T governments have significantly increased health research funding across Canada in recent years, but the absolute levels of investment have favoured either investigator-initiated fundamental research or R&D activities that are amenable to short-term economic pay-offs through private partnerships. The Committee strongly supports ongoing and greater investments in "curiosity-driven" research; as discussed below, critical capacity for epidemiologic investigation and outbreak response is built in part by nurturing the related and fundamental science. Similarly, we recognize that the private sector is not only a major investor in research but plays the key role in commercializing beneficial discoveries made with public sector support. However, these types of investments are not aligned with the unique modalities of research and evaluation that are embedded in core public health functions.

A related challenge is the profoundly multidisciplinary nature of effective research targeting an outbreak or epidemic. Many disciplines are needed: e.g., epidemiology, biostatistics, mathematics, medical microbiology, clinical medicine, laboratory science, health systems research, social sciences, and health policy. All must be engaged for the response to be optimally effective. For example, our review of the SARS outbreak in Canada has already illustrated how the ability to do etiologic or diagnostic research requires good epidemiologic and clinical data along with laboratory research capacity. A shortfall in one dimension cannot be covered by strength in another.

The need to value and support a research culture in public health arises from more than its positive impact on our ability to understand and control outbreaks of infectious disease; our standing in research affects how other nations see Canada and its public health system. Science—a system for solving problems and addressing unknowns—is the organizing principle for outbreak management and epidemic response. If other nations lose confidence in the scientific capacity and leadership in our public health system, it can have a lasting negative effect on how other countries choose to interact with Canada, be it through tourism, trade, academic and cultural exchanges, or through multilateral bodies such as the World Health Organization [WHO]. Last, beyond research and evaluation focused on infectious diseases, public health must have a strong scientific foundation and a capacity for critical self-evaluation through generation and application of evidence-based programming.

10A. Emerging Infectious Disease Research: A First Look at the Canadian Record on SARS

Experience with other emerging infectious diseases—HIV, Hepatitis C and West Nile virus, to name but three—has long since highlighted deficiencies in how Canadian research is organized to respond to emergency situations and significant new infectious disease threats. Many experts believe that a slow and poorly-coordinated research response had an adverse effect on Canada's measures to control HIV and Hepatitis C, with resulting adverse impacts on the health of Canadians and enormous direct and indirect costs. With West Nile virus, we have not as yet been able to generate a clear epidemiologic picture of the extent of the problem in humans and the severity of health risks involved. The seasonal nature of the disease means that research capacity must be poised and ready to respond as cases appear. Our current levels and modes of organizing and funding public health research make this difficult.

Earlier chapters have already indicated that the research response to SARS in Canada was uneven: some aspects were performed well; others were not. Research into the cause of SARS, the characterization of the agent, the development of diagnostic tests, and generation of initial clinical descriptions were all conducted and communicated relatively rapidly. Research on the immune response with the goal of developing a SARS coronavirus vaccine has progressed well. On the other hand, research on many fundamental epidemiologic aspects of SARS, including research on the spectrum of disease and such questions as the duration of viral shedding and the period of infectivity, has lacked cohesion. Even now we remain unable to address many of these questions. As a developed country with an acclaimed health care system, Canada has no excuse for its inability to develop an epidemiologic analysis of SARS. The Canadian performance, as already indicated in Chapter 2, contrasts sharply with Hong Kong. Scientists in Hong Kong were able to produce seminal epidemiologic and clinical descriptions while responding to a larger epidemic than Canada faced. Our incapacity arose in part from previously-identified issues of leadership, coordination, data collection and management, data sharing, and weak mechanisms to link epidemiologic and clinical to laboratory data. It also reflects lack of research capacity and advanced planning.

The Canadian research response to SARS as of early August is summarized in Table 1. The issues listed under each type of research are a non-exhaustive summary of the research questions that needed answers. At first glance, the performance appears reasonable. However, these research activities arguably address only a minimal and essential set of issues. Our preparedness for the next respiratory virus season, when SARS could reappear insidiously amidst thousands of Canadians with cough and fever of a more benign nature, would be enhanced by garnering answers to many other questions.

In Table 2, the Canadian performance is compared to the international research response. Again, this assessment was compiled to the end of July 2003. Although other valuable publications have since appeared, this is a context where timeliness of research is critical. The numbers of publications and the impact factor of publications are detailed. The impact factor is one measure, albeit decidedly imperfect, of the uptake of scientific publications. It tallies how often on average papers are cited when published in the journal in question. High-quality and more topical papers tend to be published in higher-impact journals, such as *Science*, *Nature*, the *Journal of the American Medical Association*, the *New England Journal of Medicine*, *The Lancet*, and the *British Medical Journal*. Although Canada has contributed 20% of the published world literature on SARS, many of these publications are in journals with low impact—they have limited influence on thinking and global knowledge. In addition, there is double counting of reports that were published simultaneously in the Canada Diseases Weekly Report and the US Morbidity and Mortality Weekly Report. Overall, the impact of Canadian research ranked ahead only of China, notwithstanding the fact the indexing services do not list Chinese language publications and they were accordingly assigned an arbitrary weight approximating zero.

The weakness in some areas may speak to the importance of interdisciplinary linkages as highlighted earlier. We noted, for example, that the performance in some aspects of diagnostic work was undercut by weaknesses in collecting epidemiologic and clinical data and integrating these data with laboratory work. The weak performance in research on pathogenesis may be a result of Canada's failure to develop a large cadre of clinician scientists, the fact that some clinician-scientists who had a direct opportunity to study SARS were utterly consumed with managing clinical aspects of the outbreak, and inadequate linkages between clinicians and basic scientists. We turn next to a brief comparison of the research response to SARS with what could or should have been done.

TABLE 1

A Preliminary Summary of the Canadian Research response to SARS as of early August 2003

Type of research	Issues Addressed	Canadian Performance*	Enabling or Limiting Factors
Emergent Research			
Epidemiology and public health	• Incubation period • Attack rates • Routes of transmission • Mortality rates • Infection control issues • Effectiveness of quarantine, travel advisories, passenger screening	++ ++ +++ ++ +++ +	Problems in data management and sharing, as well as poor linkage of laboratory and epidemiologic data, limited and are still limiting our ability to do these types of studies.
Etiologic and Diagnostic	• Identification of causative agent. • Most appropriate specimens source and timing. • Sensitivity, specificity of different diagnostic tests	+++ + +	Work was complicated by changing case definitions, changing classification of cases and limited integration of clinical and epidemiologic data with laboratory data.
Clinical	• Spectrum of disease • Clinical manifestations • Therapy of disease • Long term sequelae	++ +++ + +	An initial clinical descriptive paper was published, plus an analysis of critically ill patients; but little work on other aspects thus far.
Pathogenesis	• Mechanisms of disease causation • Animal models • Genetics of susceptibility to disease	++ +++ ++	Some opportunities lost because of slowness to engage basic scientists or limited number of clinician scientists. More opportunities remain unexploited.
Virology	• Basic biology • Genome sequencing • Protein characterization	– +++ +++	Existing collaborative networks facilitated genome and protein work.
Immunobiology	• Correlates of protective immunity • Vaccine development	++ ++	These studies are underway.
Post Event Research			
Health Systems Research	• Cost effectiveness of interventions • Unintended consequences of interventions • General Health Economics	+ + +	The type of research is not essential early in the epidemic response and is appropriately commencing now. However, the lack of linked and comprehensive data will impede the quality of these studies for some time.
Social and economic	• Individual impacts of the epidemic and interventions. • Behavioural research • Societal impacts of the epidemic and interventions	+ + +	CIHR has a future competition planned in these areas.
Policy	• Lessons learned • Public health implications	++ ++	These are currently in progress.

* +++ Indicates Canadian scientists completed research on the issue, which has been communicated scientifically as well as publicly. For most sub-categories of emergent research, this would be considered an adequate or better response.

++ Indicates research work is in progress.

+ Indicates research projects are being planned.

– Indicates no current work in progress or that there is no longer the ability to do the work.

TABLE 2

Numbers and Impact Ranking of Canadian SARS Research Reports as of Early August, 2003

		Canada	United States	Hong Kong	China	United Kingdom	Singapore
Epidemiology and Public Health	Publications	6	2	3	10	2	2
	Mean Impact Factor	3.4	15.0	16.3	0.1	18.0	0.0
Etiology and Diagnostic	Publications		2	2	2		
	Mean Impact Factor		15.0	9.0	0.0		
Clinical	Publications	8	2	13	15		6
	Mean Impact Factor	10.5	6.5	10.1	0.3		4.5
Virology	Publications	2	1	3	9		1
	Mean Impact Factor	11.5	23.3	17.5	0.2		13.3
Immunobiology	Publications				4		
	Mean Impact Factor				0.6		
Social and Economic	Publications	7	1			1	
	Mean Impact Factor	1.3	23.3			0.8	
Policy	Publications	1				1	
	Mean Impact Factor	13.3				6.6	
Totals		24	8	21	40	4	9
Percent		20.5	6.8	17.9	34.2	3.4	7.7
Impact Factors/ Publication		5.9	14.9	11.4	0.4	11.0	21.7

* Impact was calculated by averaging the 2001 Institute for Scientific Information [ISI] impact ranking of journals in which a given country's research was published. The analysis is based on publications listed in the US National Library of Medicine as of July 30, 2003. Journals for which the ISI has no impact factor ranking, such as Chinese language publications and the Morbidity and Mortality Weekly Report [MMWR] and the Canada Diseases Weekly Report [CDWR] were given an impact factor of 0.001 in calculating means.

10B. Outbreak Investigations and Research

Chapter 5 outlined how outbreak investigations and research interconnect. The research response to an epidemic such as SARS has several phases, including the identification, characterization, response, monitoring and post-event phases. Ideally clinical, epidemiologic, laboratory and social science research tools are used in an integrated and coordinated fashion in each phase. These phases are not entirely sequential. Each phase of the research response brings different questions and thus the required research response may be different in terms of resources or expertise. Functionally in Canada, each phase had and has different mechanisms for leadership, direction, organization, and funding. Some aspects of research are required for emergency response, while others are better suited to answering longer-term questions of equal import but less urgency.

In the identification phase the questions are: What are the manifestations of infection? What is causing the outbreak or epidemic? How is the causative agent transmitted? When does transmission occur? The cause of any epidemic is not known when cases first begin occurring. An epidemic caused by a known agent usually requires, in the initial identification phase, competent public health laboratories to test for known agents, in addition to epidemiologic and clinical research resources. An epidemic caused by a new agent, such as SARS, requires more robust laboratory research capacity. The SARS coronavirus was identified quickly with traditional technology. Advanced proteomics, genomic and genetic technologies were employed after identification to characterize the agent; such technologies may have been needed in the first instance to identify a more fastidious organism. Fortunately, these capacities were in place and operational well before an event such as SARS: Canada has considerable strengths in multiple academic centres in genomics and proteomics, and the National Microbiology Laboratory [NML] fulfilled its function appropriately as a national reference laboratory. These responses also depended on existing collaborative relationships. For the future, Canada should develop and sustain a strong national network of fundamental and applied scientists capable of rapid research responses to the next outbreak of a novel infectious agent within our borders.

In the characterization phase, research turns to the development of diagnostic tests, determining the spectrum of disease, assessing the extent of infection, and delineating the mechanisms of disease pathogenesis. We now have effective diagnostic tools in Canada. Indeed, multiple sites have been active in developing and enhancing SARS-specific diagnostic technologies. However, the Canadian research response has yet to generate meaningful data on the spectrum of disease, the extent of infection, and understanding of mechanisms of disease pathogenesis. The international public health community was looking to Canada for answers to questions of global significance, and our response was inadequate.

Bringing an epidemic under control requires effective public health and clinical action. Research on the response to an epidemic is important to understanding the effectiveness of interventions and refining or abandoning them. The interventions used in the response to SARS—antiviral treatment, quarantine and isolation, suspension and redirection of hospital activity, travel advisories, screening of travelers—all were employed empirically. Adverse effects ranged from direct drug toxicity for patients treated with antiviral drugs, to loss of income and psychosocial consequences for those in quarantine. At a macro-level, the consequences ranged from modest inconveniences (longer airport line-ups) to very serious health threats (delayed health services) for hundreds of thousands. There were also national economic impacts that affected millions of Canadians. There were and still are few data on which to base judgements about the relative benefits of any of these interventions. Some caused adverse effects without any benefit. For example, during SARS there was a laudable attempt to conduct an emergency clinical trial of ribavirin. However, before this could be mobilized, ribavirin became the "standard of care" for SARS and a trial was no longer thought to be "ethical". Unfortunately, ribavirin use in SARS patients had a high rate of adverse events. Later in vitro research showed no activity of the drug on the SARS coronavirus. The suspension of elective services in hospitals and quarantining of thousands of individuals, as occurred in Ontario, had obvious adverse impacts.

All these decisions were made in the face of crisis conditions and the pressing need to contain a serious outbreak. Careful evaluation of the effectiveness of the relevant public health and clinical measures should not imply any adverse verdict on the judgement of those who used them. Science progresses by turning today's truths into tomorrow's mistakes. Evaluation in hindsight is always easier than decision making under duress. But that is all the more reason why evaluation should occur to inform future decision making. It needs to be conducted now, so that potential future epidemics can be dealt with using interventions with the least unintended negative effects.

Finally, passenger screening was implemented at substantial cost to the public health system and travel advisories were issued with severe economic effects. In the end, were there any positive health effects from these measures? We need to know their impact with certainty and communicate the results.

Monitoring the effectiveness of response through enhanced surveillance becomes important as an outbreak comes under control. This is the phase of research we are in now. As already noted, enhanced surveillance will be extremely important nationally and for other jurisdictions in the northern hemisphere as we enter the next respiratory virus season.

Once an epidemic is over, various types of post-event research can be undertaken. The biomedical, clinical, epidemiologic and public health research activities initiated during the initial phases of outbreak response must be moved to completion. For SARS, there is a continuing need for more long-term fundamental research into the basic biology of the virus, with a view to designing more effective therapies and developing a vaccine. "Lessons-learned exercises" are another type of evaluative research focused on system improvement. This report is an example of one such exercise. Parallel work for Ontario is underway with the Walker Panel and Campbell Investigation; an expert panel chaired by Prof. Sian Griffiths and Sir Cyril Chantler of the UK is similarly providing a third-party assessment of the SARS outbreak response in Hong Kong.

Assessing the long-term sequelae of SARS and its overall health impacts are some of the other types of research that are required. Many questions remain unanswered. Do patients affected with SARS all recover full respiratory function? How many patients and health care workers suffered lasting psychosocial harms? What exactly was the economic impact of SARS on institutions and the various segments of the Canadian economy? In this *post hoc* phase of research, more usual research processes may be appropriate.

10C. Reflections on the Research Response to Epidemics

10C.1 Business as Usual

Canada has generally produced research on emerging infectious diseases through the academic model. That is, research is initiated and carried out by one or a few investigators who have an interest in a question; it is funded through peer review, and communicated through peer-reviewed channels. These normal processes for planning, approving, funding, conducting, analyzing and communicating research are ill-suited to meet the early research needs of an epidemic response. Changes must be made during an epidemic investigation, just as changes in the health system's hierarchical structures must be made for effective outbreak management.

Peer review, of course, remains the overall gold standard for what science is performed and where it is published (and thus noticed). Peer review has its failings and critics; however, to paraphrase a similar tag about democracy, it is the worst system for assessing science—except all the others. The basis for this system is to ensure that the highest quality, most important research is performed and that it is verified by other scientists. During an epidemic, the necessity of timely response means that formal peer review is not practicable. This does not mean that quality should be sacrificed. High quality science in the course of an epidemic can be assured by having teams of scientists who are normally full participants in the peer-reviewed processes—competitive granting and publishing in peer-reviewed journals—in place to respond to emergency research needs. Furthermore, this team must have processes for dynamic interchange and critical evaluation of each other's ideas on a rapid timeline. In short, strong leadership by excellent scientists, coupled with internal and external informal peer discussions of experiments and findings, can ensure that emergency work remains high quality.

10C.2 Mobilization of Scientific Resources

In order for scientific resources to be mobilized, they need to exist and be organized in a fashion that permits rapid (less than a day) deployment. Canada needs a cadre of cutting-edge scientists in the public health, clinical, and biological spheres of infectious diseases, who can and will drop everything on short notice and apply their skills to the solution of the health threat at hand. To be cutting-edge and prepared, they must be actively engaged in research and part of the overall Canadian research community on a continuing basis.

This in part is a key role for government science. Strategic investments in government public health science capacity—such as the NML and the BC CDC—were important factors in Canada's ability to respond to SARS. However, networks based in academe and the private sector are also needed to broaden and deepen our response capacity. These research networks cannot be about subsidizing "business as usual", or providing retainers to purchase the goodwill of a set of academics in hopes that they may elect to help out in a national emergency. Funds should flow to build specific capacities and establish delineated obligations—such an apparatus must be established in advance with clear ground rules. Hospitals and universities are useful partners, but the primary connections must be with individual scientists who want to be part of a research response team. Furthermore, epidemic research needs to be organized so that it can react in any or several areas of the country at a given time, and provision must also be made for urgently mobilizing scientific resources from outside the health sector.

The US Centers for Disease Control and Prevention [CDC], for example, co-opted US coronavirus experts shortly after the virus was linked to SARS. Similarly, in the laboratory investigation of SARS, the NML linked to academic institutions, provincial agencies and the private sector. This resulted in the first full-length genome sequencing of the SARS coronavirus by a collaborative team from the Michael Smith Genome Sciences Center, the BC CDC, and the NML. Government investment in basic science capacity over the last several years created research strength that could be drawn into action. However, the timely assembly of such collaborations can only occur if there is already a degree of connectedness, trust and scientific respect. The middle of an epidemic is not the time to be establishing new linkages and collaborations.

Overall, the SARS experience argues that capacity for cutting-edge science in government is needed, and it needs to be fully connected to and integrated with academic and private sectors through interchanges, joint appointments, collaborations and formal and informal networks. Fostering these linkages should be an integral part of the workplan for a new Canadian Agency for Public Health and the F/P/T Network for Communicable Disease Control. The network should give special priority to linking research in government and academic institutions with a focus on infectious diseases, thereby building the teams and business processes for rapid epidemic investigation that will strengthen Canada's ability to respond to the 'next SARS'.

While some aspects of laboratory research on SARS in Canada were a source of national pride, we have already outlined that more could have been done. Reports on interim laboratory results were not produced and communicated as often as they could have been. Effective linkage of laboratory research at the national level to the clinical and epidemiologic research efforts at the provincial and local level never really happened. Academic linkages tended to be geographically limited.

Mobilization of epidemiologic and public health research was particularly weak. As noted earlier, the research capacity in provincial public health agencies varies, but with some exceptions, is very limited. Indeed, little scientific capacity exists in most local and provincial agencies. The Committee sees an acute need for stronger academic linkages and in-house research capacity for public health agencies at the provincial/territorial level and in major municipalities. Supporting such linkages and capacity should be a funding priority in the transfer programs from the Canadian Agency for Public Health.

Health Canada's capacity in these areas is also limited. The Centre for Infectious Disease Prevention and Control, the main part of the Population and Public Health Branch responsible for surveillance and epidemiologic research on infectious disease, employs only 12 medical epidemiologists and public health practitioners and 9 PhD epidemiologists. Their research productivity varies in part because of competing demands on their time, and in part because the current structures do not lend themselves to academic partnerships.

Connections between the academic sectors in epidemiology and public health and local, provincial and national counterparts have in some cases been eroded. The expiry of initiatives such as Public Health Research Education and Development [PHRED] in Ontario has resulted in the collapse of teaching public health units. As a result, in Toronto during the height of the epidemic, the academic public health sector was not drawn into needed epidemic research, and as yet has produced very little research in these areas. To pick up a theme from Chapter 7, public health units and public health practitioners in major centres need to be integrated into the academic sector in much the same way that teaching hospitals partner with universities and community colleges. The cross-fertilization will improve training opportunities, create more varied and attractive career paths, build a strong research culture in public health, and facilitate the rapid emergence of teams of investigators who can participate in epidemic investigation.

In the latter stages of the SARS outbreak, large research coalitions did begin to emerge in Canada. These include the SARS Research Network in Toronto and the SARS Accelerated Vaccine Initiative in British Columbia. The Canadian SARS Research Consortium was initiated in late May 2003 to "coordinate, promote and support SARS research in Canada and develop international linkages and partnerships to control and eradicate SARS." The consortium was catalyzed by the Canadian Institutes of Health Research [CIHR] to deal with the immediate threat posed by SARS. If it proves successful, the Canadian SARS Research Consortium could become a model and evolve into a more permanent structure to address newly emerging infectious diseases in Canada. The funding partners include the CIHR, Genome Canada, Health Canada, GlaxoSmithKline, the Michael Smith Foundation for Health Research, the Ontario Research & Development Challenge Fund [ORDCF], Fonds de la recherche en santé du Quebéc [FRSQ], the Protein Engineering Network of Centres of Excellence [PENCE], and CANVAC (the Canadian Network for Vaccines and Immunotherapeutics). The Consortium intends to work in diverse areas, such as diagnostics, vaccine development, therapeutics, epidemiology, databases, public health and community impact.

10C.3 Leadership, Organization, and Direction of Research

The usual consensus-building processes for scientific collaboration are difficult to follow in the face of an outbreak and the required research response. Furthermore, assuming that F/P/T public health research capacity is created within public agencies and institutions, jurisdictional tensions could still emerge and impede the research response to the next major outbreak. These concerns suggest the need for clarity about scientific and research leadership in epidemic research responses.

This is not a straightforward matter. Researchers are not often skilled in management. Moreover, management skills are necessary but not sufficient for the discharge of a leadership role in a crisis. Attempted research leadership also sometimes runs afoul of research 'followership', i.e., researchers resist being organized and steered at the best of times. They have a healthy scepticism about authority, and highly-specialized expertise that is unlikely to be matched by a particular leader. Leadership of a scientific team accordingly derives from competence, respect, interpersonal and communication skills, and mutual trust as much as it does from the authority given to someone in a particular position. This is doubly so when the scientific team is a network of individuals outside a hierarchical organization, in which participants have the latitude to choose their collaborators and their research foci. Furthermore, decisions need to be made in a timeframe that may not allow consensus building.

During the SARS epidemic, effective overall leadership on research was lacking, particularly in the epidemiology and public health sphere. Multiple public health units were involved but coordination was limited and staff were consumed with fighting the outbreak. The provincial public health branch did not have sufficient in-house research capacity or highly-developed academic linkages. As noted in Chapter 2, scientific firepower was marshalled in an advisory committee to support the executive team that oversaw the provincial emergency in Ontario, but this group did not have the time, data, or clear mandate to coordinate the relevant epidemic research. In future, research leadership for outbreak investigation must be determined well in advance, along with a tentative set of managerial structures to move a research agenda forward.

One such structure, as noted earlier, is the creation of a connection between the outbreak management team and the research response team—a B-Team as pioneered by the CDC. This would be a group whose task it was to think critically about the scientific questions, generate ideas for research, and offer sober second thoughts on the overall direction of an outbreak response.

More generally, the research structures themselves need not mirror the command-and-control apparatus needed for effective management of the outbreak per se; but they will be more hierarchical than normal in research. Put another way, the scientific team must have a quarterback and a play book that all will use, albeit temporarily until post-event research brings the more free-flowing processes of normal science on stream.

Those normal scientific processes involve redundancy, repetition and uncoordinated replication, and competition. These processes, with their centripetal tendencies and creative anarchy, have paid huge dividends for society. However, they are too slow, unpredictable, and expensive for outbreak research. This underscores the need, outlined earlier, for two synergistic elements in the research response: a strong scientific presence in publicly-managed and -accountable institutions, and funds flowing through structures that draw non-governmental partners into a network with a clear set of research responsibilities.

For example, in the early stages of the SARS outbreak, laboratory research was relatively well-coordinated because it was centralized. As the health care and academic sectors became engaged and testing for the coronavirus became more widely available, laboratory activity became more fragmented. The ability to track laboratory results disappeared. Central data management was not maintained. Indeed, although many stakeholders called for action, it was not clear who, if anyone, had the authority to insist on better coordination of data management.

The epidemiologic, clinical, public health and social science research efforts were even more fragmented. Health Canada attempted to direct some of the epidemiologic and public health research by developing research protocols and providing funding and direct support. However, progress has been frustratingly slow. The CIHR demonstrated substantial agility and provided some welcome leadership through a special SARS competition, in May. However, some of the individuals who were best placed to address the central questions were already deeply engaged in fighting the outbreak and hardly in a position to write elegant grant applications. An accelerated granting competition may be worthwhile for slower-moving outbreaks or for rapid post-event research, but was criticized by a number of informants as misplaced in the midst of continuing efforts to contain a fast-moving outbreak such as SARS.

Some mechanism for ongoing coordination of SARS research is still needed, as pressing questions remain unanswered. The Canadian SARS Research Consortium and the SARS Accelerated Vaccine Initiative are two examples of efforts to coordinate the research effort. However, these coordinating bodies are operating under no particular authority, and a wide range of other activity is now underway without formal cross-linkages, networking, or coordination. Research on the development of diagnostic tests is illustrative. Diagnostic research can only be done if there is access to clinical specimens. These are only available in any quantity in a few institutions that may or may not be interested and willing to provide them to researchers. The amount of material is limited so that not every demand for material can be met.

There are also serious organizational and ethical issues in how diagnostic specimens can be drawn into a coordinated research effort. Some researchers have suggested that Canada create a national SARS database to facilitate research, pulling together relevant clinical, epidemiologic, laboratory, and, where applicable, pathological data. This would be novel and ideal. However, individual researchers do not have control over data that accumulate during the response to an outbreak. The data are now held in many different institutions and agencies; they are subject to constraints of confidentiality arising from their acquisition as part of a local public health investigation or clinical encounter.

As well, in usual circumstances, those who generate data "own" the data and decide what is to be done with them. These researchers are under no obligation, except perhaps a moral one, to make data available to others who may be able to use it better. The same applies to biologic materials. These practices must change during provincial and national emergencies, and perhaps more generally.

Thus, a fundamental question that Canada needs to answer is: Who "owns" the various streams of precious scientific data that emerge during an outbreak? During the Health Canada SARS conference in Toronto on April 30/May 1, 2003, it was suggested that the idea of "ownership" of data during an outbreak should be permanently replaced by "stewardship". Operationalizing this idea will be challenging, but is worthy of pursuit.

As a corollary, how can the confidentiality of the affected patients and their contacts be safeguarded in any data amalgamation process? Some informants believe that confidentiality and privacy concerns can be readily managed by having each group or institution in a data stewardship consortium agree on a protocol for "anonymizing" the data, and then using common non-nominal identifiers to create the means for linking data from multiple sources. On the other hand, we noted in Chapter 9 that the *Privacy Act* and *The Personal Information Protection and Electronic Documents Act* and related provincial laws are not well suited to disease surveillance, outbreak investigation, and applied research in the face of infectious diseases. In this regard, an epidemic caused by a new agent presents some unique issues. In broad brushstrokes, the US approach has been to consider public health investigations somewhat differently than planned research activity with respect to some of these ethical issues. More thinking about the ethical and legal dimensions of public health research and outbreak investigation is needed. The rights of the individual must be balanced against the public good of disease surveillance and epidemic research that will safeguard the population's health.

In sum, for future emerging infectious disease threats, some process for coordinating the research effort nationally needs to be in place. A restructured national public health system should have this role, along with the authorities to direct and coordinate research, establish national databases and research platforms, ensure that appropriate ethical and privacy safeguards are in place, and provide resources to fund epidemic response research.

10C.4 Funding

We have already seen that the usual peer-reviewed mechanisms for funding research are not suited to the immediate initial phases of epidemic research. Certain research activities must be carried out regardless of flaws in study design. An outbreak is not the time to allow "the best to become the enemy of the good"; a response must occur. The initial funding for research conducted on SARS was not peer-reviewed in the formal sense and was provided entirely by affected health care institutions or directly by governments. The quality of the work was ensured by pre-existing capacity and networks of scientists who provided real-time informal peer review. Subsequently, the peer-reviewed granting agencies responded to SARS research needs and began funding SARS research in a relatively rapid timeframe. However, at this point we have largely lost the ability to perform clinical research on the pathogenesis of SARS.[1]

It appears that the CIHR was able to hold an accelerated competition in part because of a quirk in their finances for fiscal year 2003-2004. The CIHR and other agencies need to have the capacity to respond to new threats rapidly through the creation of special funding envelopes. It is surprising that the Canadian Food Inspection Agency [CFIA], as an agency with a legislative mandate similar to the CIHR, is able to roll funds over on a 24-month basis while the CIHR is not. Extending this administrative policy to CIHR would clearly improve the CIHR's flexibility in responding to emerging infectious diseases and other fast-breaking research issues.

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[1] It is arguable that, funding aside, pathogenetic research was impeded by a dearth of clinician scientists and the pressures they were under in fighting the outbreak.

Canada's investment in infectious disease research and special funding for SARS is detailed in Table 3. To date, the Government of Canada has invested or committed about $6.7 million (Health Canada has spent about $2 million on research, the CIHR has announced or held competitions for $2.7 million and the Minister of Health has reallocated $2 million for SARS research to the NML) on SARS research. This does not account for what has been spent directly by health institutions and provincial governments in responding to SARS. The investment seems small in relation to a problem that infected more than 400 people, killed 44, resulted in thousands in quarantine, shut down the health care system in Toronto, had huge direct and indirect costs, and probably affected national economic indices. It is especially small when one considers that $20 million have been allocated for advertising campaigns to enhance tourism in Ontario post-SARS.

TABLE 3

Canadian Spending On Infectious Diseases Research and SARS Research To Date

	All Infectious Diseases (C$ millions)	Special Allocations for SARS (C$ millions)
CIHR[2]	71.5	2.7
NSERC	2.8	
Genome Canada[3]		
Canada Foundation for Innovation	24	
Networks of Centers of Excellence[4]		
Health Canada – National Microbiology Laboratory (internal and external funding)	13	3
Health Canada – Center for Infectious Disease Prevention and Control (internal and external funding)	5	1
Health Canada – Laboratory for Food Borne Zoonoses (internal and external funding)	5	
Provincial Governments	Unavailable	12
Total	**120+**	**17.7**

In recognition of the unusual nature of SARS and the importance of research, some novel funding initiatives have developed. British Columbia's SARS Accelerated Vaccine Initiative has made $2.6 million available for SARS vaccine development. The Ontario Research and Development Challenge Fund announced $10 million to create an Ontario infectious diseases network. Part of the funding will be to match the support for Ontario-based scientists who are successful in obtaining CIHR funds for SARS research.

All these initiatives are commendable, but the capacity of the research community to respond is limited. The creation of scientific capacity is a long-term process. It involves coordination of support across post-secondary institutions, granting councils, and the health charities, together with an ongoing demand for highly-skilled personnel and a career path that makes a particular field attractive. Furthermore, as the Canadian Veterinary Medical Association [CVMA] highlighted, capacity-building investments must be extended in new directions. Given the importance of zoonoses, the CVMA questions why "virtually nothing" is spent to predict which diseases in animal populations may jump to human communities, and to prevent such cross-species transmission. This capacity-building must involve the private sector as well as the public sector. For example, Canada's Research-based Pharmaceutical Companies suggest that industry is prepared to invest not only in biomedical investigation but broader health research, including social sciences.

In sum, targeted competitions on a short timeline will simply flow more money to already-overloaded investigators or subsidize second-rate research unless a mature scientific community with appropriate breadth and depth exists and is ready to respond to requests for proposals. A careful balance must be struck across three areas of funding: open competitions to support investigator-driven science; targeted competitions that seek to support, preferentially, work in specific areas; and mission-oriented research with a strongly applied focus (as occurs during outbreak investigation).

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[2] CIHR submission to the National Advisory Committee on SARS and Public Health, July 28, 2003.

[3] Genome Canada currently has a competition for applied genomics in health which will invest in infectious diseases.

[4] Two networks are funded, the Canadian Bacterial Diseases Network [CBDN] and the Canadian Network for Vaccines and Immunotherapeutics. CBDN funding as a National Centre of Excellence [NCE] is coming to an end. Two NCEs, the Protein Engineering Network of Centres of Excellence [PENCE] and the Mathematics of Information Technology and Complex Systems [MITACS] have funded SARS research projects.

10C.5 Communications

Scientific communication changes substantially in epidemic situations and is fundamentally different from normal processes and procedures. Public communications issues were detailed in Chapter 5. This section considers communication of scientific information within the scientific community, to public health officials, and to the media.

In a non-epidemic situation, research is communicated through peer-reviewed channels—scientific conferences and scientific journals. This process is slow, but valuable because it serves to validate results. Communications with the public happens in most instances after some form of peer review and communication to other scientists. During the SARS epidemic, communications among laboratory scientists nationally and internationally were effective and efficient through the use of international conference calls and the Internet. An important innovation was the impromptu network of laboratories and supporting web page rapidly put in place by WHO. This resulted in a very early exchange of ideas, results, reagents and protocols and significantly speeded up identification of the coronavirus and confirmation of its link to SARS. The framework for international communication and collaboration came together in less than two weeks. This successful process should be studied, codified, strengthened, and replicated wherever necessary.

Nationally, communication of laboratory results was facilitated through dissemination of a summary of laboratory results from the NML. The frequency of production was limited by a weak capacity for analysis at the NML. Other limitations in communication involving laboratories were outlined in Chapter 6. On balance, however, information moved reasonably well.

The same cannot be said for communication about the epidemiologic aspects of the science. Global epidemiology and public health networks did not develop until much later in the epidemic. Nationally, although Health Canada made significant efforts to obtain and communicate information on the epidemiology of SARS, shortcomings in data management and analysis meant that very little in the way of epidemiologic information was generated to communicate. Thus, the issue may be more one of content than communication capacity.

As was true internationally, teleconference calls and the Internet were the basic communication tools used nationally by researchers. Teleconferences were effective but highly inefficient. Individuals who were key players in the response at all levels spent many hours every day on conference calls. From the Health Canada perspective, since the relevant individuals from the most affected areas were stretched so thinly that they were too busy to participate, this led to the Kafkaesque situation where calls involved discussion among regions that were unaffected. Consideration needs to be given to how to improve the efficiency of communication during emergency response, starting with the creation of adequate local and regional activity so that communications can be sustained while the response to an outbreak is underway.

Formal publication of results also changed during SARS. Researchers had the unusual experience of finding that editors of the most respected journals were lobbying for submissions and offering turn around in a matter of days for review and publication of electronic papers. Trends toward rapid e-publication that were already in the offing may have been accelerated by SARS.

During an epidemic, research is conducted in a fishbowl. This meant that during the SARS epidemic, preliminary scientific results were widely reported in the press more or less as the findings were produced. This resulted in considerable pressure on Canadian scientists, and shaped scientific communications in subtle ways. For example, modest and reasoned differences in viewpoints among experts concerning causative agents appeared to be black-and-white disagreements when selected sound-bites were aired or quotes chosen for use by print media. Honest differences should be shared with the public, but the Committee perceives that there was clear scope for better coordination of how scientists communicated with decision makers and the public.

10D. Capacity for Relevant Public Health and Infectious Disease Research in Canada

As one indicator of research spending on infectious diseases, the CIHR now has an annualized commitment of $71.4 million to this broadly-defined field. This investment might be considered "over-invested"[5] if viewed solely with an eye to the relative burden of disease. The problem, of course, is that the CIHR's overall budget on a per capita basis continues to lag hugely behind the US National Institutes of Health. Compared to the USA, spending by our national health research agency on infectious diseases represents a substantial under-investment, and many other areas of health research have presumably fallen even further behind. The CIHR's spending includes 11 randomized controlled trials for a total of $3.88 million, and the HIV Clinical Trials Network for

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[5] CIHR submission to the National Advisory Committee on SARS and Public Health, July 28, 2003.

$4.2 million; 527 operating grants for $52.6 million; 91 career awards for $5.56 million; and 181 individual training awards for graduate students and post-doctoral fellows for a total of $4.30 million. As an example of under-investment in infectious diseases research, the CIHR currently has no funded projects on West Nile disease.

Epidemiologic and public health research on infectious diseases is considerably under-invested. "CIHR's investment in infectious disease research flows primarily to support biomedical research (84%), and the emphasis on biomedical research in this field is stronger than in the CIHR's overall portfolio (72%)."[6] Furthermore, there are no specific CIHR investments in emerging infectious diseases, although the Institute of Immunology and Infectious Diseases is planning a special initiative in this area. According to a brief inventory by the CIHR, "NSERC provides about $2.8 million in operating support per year in areas ranging from studies into fundamental biology of pathogens, through to more applied studies of vaccines and antimicrobials, agricultural practice, and food safety. As well, "the Canadian Foundation for Innovation has invested close to $24 million in infrastructure and equipment in the area of infection and parasitic diseases." Two federally-funded networks of centres of excellence are relevant: the Canadian Bacterial Diseases Network and the Canadian Network of Vaccines and Immunotherapeutics [CANVAC]. There is no network focused on viral diseases. "Genome Canada has funded three large projects relevant to human infectious disease, on Cryptococcus, *Candida albicans*, and viral proteomics."

Other relevant federal investments include the National Research Council's Institute of Biodiagnostics located in Winnipeg and its Institute of Biological Sciences, located in Ottawa. The latter has developed an effective vaccine for Group C meningococcal disease.

According to the CIHR, "A ballpark estimate for federal investment in infectious diseases research would be $100 million per year. However, as in most other areas of science, there is little coordination between agencies in how those funds are invested or in developing a federal research agenda."

We have noted above that essential capacity for leading and performing the needed research in response to an epidemic must reside in government-funded public health institutions. How robust is the capacity for this type of research in public health institutions? The Committee perceives that, with a few exceptions, the overall research capacity in provincial public health is limited. Ontario has seen a decline in the number of laboratory scientists in its provincial laboratory; analytical capacity in the provincial public health branch was notably limited during SARS. British Columbia, Alberta and Quebec have strength in some areas, but no other provinces have internationally-competitive laboratory research capacity in the public health realm.

The situation is worse in the epidemiologic and public health fields. The Committee's assessment is that, with the possible exception of Quebec's National Institute of Public Health, no province has broad public health research capacity within its public sector. British Columbia has strength in specific areas through its Centre for Disease Control. Manitoba at one time had a productive epidemiologic research unit but it has largely disintegrated owing to lack of targeted support. We detailed earlier the loss of Ontario's PHRED program and the lack of linkages between health units and universities or community colleges. The same malaise that has led to profound shortages in human resources for public health has undermined research capacity in the field.

Recognizing the capacity issues, the CIHR has recently funded five new strategic training initiatives in infectious diseases. This is a positive step, but CIHR's record shows that its absolute increases in support for biomedical science have meaningfully outstripped expansion across the other three "pillars" combined—those being clinical investigation, health services research, and population and public health research. This asymmetric growth in CIHR spending is partly a capacity problem in areas other than biomedical research, but also reflects the CIHR's difficult mandate of meeting research needs for all imaginable stakeholders. It is very unclear whether the separate CIHR Institutes can address the capacity for public health research, particularly in epidemiology and the social and behavioural sciences.

10E. Recommendations

Some aspects of the research response to SARS went exceedingly well in Canada; other aspects did not. The reasons for these failings can be summarized briefly as follows. Governments have not consistently recognized that research is a core public health function, and supported it. Canada's considerable new investment in research has not adequately targeted public health and epidemiologic research, nor has there been substantial thinking about creative partnerships and programs to build public health research capacity. Furthermore, support for clinician scientists has been limited. Canadian research structures and procedures are not designed for the type of research response that is required in an epidemic. The actual capacity for key types of research in public health institutions has been constrained by: the weak research and evaluation culture in multiple levels of governments; limited career paths for public health practitioners in various disciplines at the federal, provincial, and local levels; a lack of programs and opportunities to prepare personnel from multiple disciplines for public health research in general and investigation of emerging infectious diseases in particular; and pressure on existing personnel such that research and evaluation activities, if funded at all, must be squeezed in between other pressing work demands. Finally, there are no mechanisms for national leadership, coordination and direction of epidemic research.

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[6] CIHR submission to the National Advisory Committee on SARS and Public Health, July 28, 2003.

To prepare for future SARS outbreaks, which could be as close as the next respiratory virus season, Canada needs to take stock and complete some important SARS-related research projects as quickly as possible. We also need to make longer-term changes. Although SARS was only a moderate-sized outbreak, it highlighted a number of deficiencies in our research response that could have been extraordinarily damaging had the agent been even more infectious or dangerous. We now have the opportunity—indeed, an obligation—to address the structural, procedural and capacity issues that prevented a more effective research response to SARS in this nation.

The Committee accordingly recommends that:

10.1 The Canadian Agency for Public Health should earmark substantial funding to augment national capacity for research into epidemiologic and laboratory aspects of emerging infectious diseases and other threats to population health. This enhanced national public health science capacity should be strongly linked to academic health institutions through co-location, joint venture research institutes, cross appointments, joint recruitment, interchange, networks and collaborative research activities.

To this end, in the notional core budget for the Canadian Agency for Public Health outlined in Chapter 3, we foresaw new spending rising to $50 million per annum on infectious disease capacity, including research elements, and another $25 million in general public health R&D functions. Some of these activities would be in-house; many would be initiated in collaboration with academic partners, provinces and territories, major municipal health units, and research agencies, particularly the CIHR.

10.2 The Canadian Agency for Public Health, in partnership with provincial and territorial governments and through the F/P/T Network for Communicable Disease Control, should directly invest in provincial, territorial, and regional public health science capacity.

The $100 million earmarked for 'second-line' capacity, including the operation of the F/P/T Network for Communicable Disease Control, is the logical source of funding for this purpose. Options include directed funding flows to existing provincial/territorial bodies or the creation of joint F/P/T regional institutes. The mandate of these bodies would be to provide public health research services to the provinces and territories.

10.3 The F/P/T Network for Communicable Disease Control, in partnership with the CIHR and the Canadian research community, should develop clear protocols for leadership and coordination of future epidemic research responses.

10.4 The Canadian Agency for Public Health and the F/P/T Network for Communicable Disease Control should ensure that epidemic response teams initiated as part of the Health Emergency Response Team [HERT] concept, provide not only surge capacity for outbreak containment per se, but also a mobile "B-team" and investigative infrastructure, including epidemiologists, programmers, and analysts.

10.5 The Canadian Agency for Public Health, in partnership with provincial/territorial governments, should develop clear rules, reinforced by intergovernmental agreements, on the sharing of information, the establishment of national databases, and the use of biologic materials for research in response to epidemics.

10.6 The Canadian Agency for Public Health, in collaboration with the CIHR, should establish a task force on emerging infectious diseases to recommend research priorities and funding mechanisms. The Agency, in collaboration with the CIHR and other national research funding bodies, should support the development of special funding mechanisms and processes for fast-tracking research related to epidemics of infectious diseases.

10.7 The Canadian Agency for Public Health, in partnership with research agencies and provincial/territorial governments, should work with universities to improve research training opportunities in infectious diseases and outbreak management for the full range of involved disciplines. This capacity-building focus should be a priority within the broader health human resource strategy of the Agency (see Chapter 7).

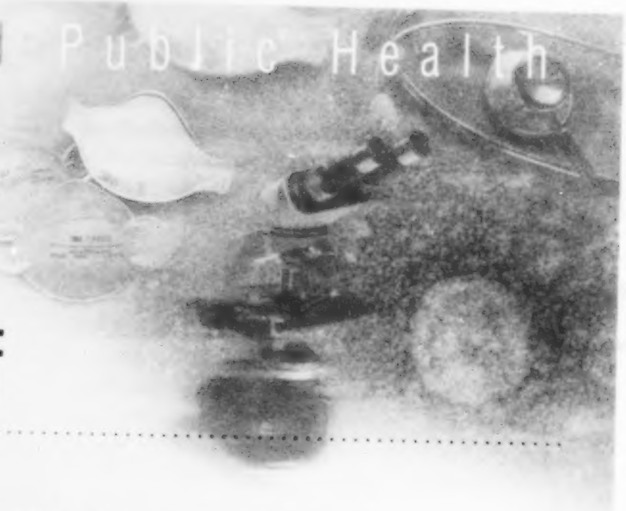
10.8 The Government of Canada should strengthen its R&D functions in international health outreach, with particular emphasis on emerging infectious diseases on a global basis.

In this respect, as suggested in the brief discussion of ethics in Chapter 9, the Committee believes that Canada has an obligation to be more engaged in outreach activities that will help build research capacity in less developed nations. These investments should have positive long-term impacts on the health of populations in those nations, and thereby complement conventional forms of assistance provided by the Canadian International Development Agency and other agencies. We return to this issue in Chapter 11.

10.9 The Government of Canada should foster workable public-private partnerships with the biotechnology, information technology, and pharmaceutical industries for shared research interests in the realm of emerging infectious diseases, including new vaccines, antiviral compounds, immunotherapies, and diagnostic technology.

10.10 The Canadian Agency for Public Health should spearhead discussions on the issues of intellectual property, copyright and patenting from public health inventions.

Chapter 11



VIRUSES WITHOUT BORDERS: International Aspects of SARS

The SARS outbreak illustrates Marshall McLuhan's prediction that the world would become a 'global village'. It took smallpox centuries just to cross the Atlantic; a few weeks after arriving in Hong Kong from Guangdong, SARS had already spread to 30 countries on five continents. As of July 2003, the direct clinical toll of SARS was already about 8,500 probable SARS cases and more than 800 deaths worldwide. The global economic and social toll has been nothing short of staggering.

The story of SARS in Canada has had international dimensions from the outset. In both Ontario and British Columbia, SARS was imported by Canadians returning from Asia. Conversely, it appears that only three individuals developed SARS after leaving Canada, with onward transmission only by one person who went to the Philippines.

In this chapter we focus on three key international aspects of the SARS outbreak. First, we see again that Canada must have the reporting systems, collaborative mechanisms, and resources in place for other members of the family of nations to be satisfied that we can meet our obligations to contain outbreaks. Second, SARS was the first instance in which the World Health Organization [WHO] issued travel advisories. Not only were the evidentiary foundations for WHO intervention weak, but there are more general concerns about the basis for and effect of travel advisories, including Health Canada's own practices in this regard. Third, the federal government needs to review its measures for disease screening and health-related support at ports of entry to Canada. Airport screening measures, in particular, appear to have little yield.

11A. International Background

11A.1 Health Canada's Role

> *"National boundaries no longer offer isolation or protection from infectious diseases, toxic chemicals, and hazardous products."*
>
> *—Lac Tremblant Declaration, 1994*

As noted in Chapter 3, in 1992 the Institute of Medicine—a division of the National Academies of Sciences in the United States—released a report describing the growing concerns about the resurgence of infectious diseases.[1] A little less than two years later, Health Canada's Laboratory Centre for Disease Control convened a three-day meeting at Lac Tremblant. Forty leading scientists gathered to discuss and debate the Institute of Medicine report and consider its implications for Canada. Their conclusions were reflected in the "Lac Tremblant Declaration," that recommended the development of national strategies for the surveillance and control of new and resurgent infectious diseases. These recommendations recognized the ongoing emergence of infectious diseases in Canada, such as Lyme Disease (1975), Legionnaires' disease (1976), HIV/AIDS (1981), *E. coli* O157:H7 (1983), hepatitis C (1989), and Hantavirus (1993).

Although some within the federal government accepted the pressing need for a national plan, the available resources were insufficient to allow a comprehensive approach. The Institute of Medicine report and the Lac Tremblant meeting did contribute to the development of the Office of Special Health Initiatives, organized within the Laboratory Centre for Disease Control at Health Canada. Focusing on global mobility and its implications for infectious disease spread, the Office of Special Health Initiatives developed the Travel Medicine and Migration Health programs and the Montebello Process, which offered advice to other government departments concerning screening of immigrants for infectious diseases. After a Health Canada reorganization in 2000, these activities were incorporated into the new Centre for Emergency Preparedness and Response.

Through its membership in WHO, Canada accepted the obligation to report nationally on only a few diseases (e.g., plague, yellow fever and cholera). As noted in Chapter 9, WHO has been updating its regulations and is developing new standards for surveillance and control of communicable disease. Even in the absence of such international standards, however, multiple observers had already identified a threat to the domestic control of infectious diseases from the lack of a truly national surveillance and reporting system. SARS has now sharply illustrated the international realities that make it untenable for each province or territory to choose when and what infectious disease data to report to other jurisdictions, including the federal government. Measures already recommended throughout this report should, if adopted, rapidly remedy this situation.

International Collaborations

Collaboration among nations is beneficial to Canada in part by ensuring that the nation has intelligence on emerging disease trends so that citizens and our health systems can be informed and act accordingly. Health Canada works closely with WHO in the area of infectious diseases. Canadian representatives sit on the advisory boards of WHO's Communicable Diseases cluster and the Global Outbreak Alert and Response Network [GOARN]. WHO relies extensively on Health Canada's Global Public Health Intelligence Network [GPHIN]*, a unique early-warning system mentioned in several previous chapters. GPHIN continuously scans Internet media sources for reports of infectious disease outbreaks around the world. Three Health Canada staff members are seconded to WHO to provide technical advice, support, and training opportunities, but not explicitly to improve liaison. As well, Health Canada's Population and Public Health Branch [PPHB] includes a number of WHO Collaborating Centres, enabling alliances to improve epidemiologic and laboratory response to international issues.

Health Canada has close ties with the US Centers for Disease Control and Prevention [CDC], and the two bodies have engaged in many collaborative programs over the years. Health Canada plays an important role in international working groups, such as those that have recently been created to prepare for the possibility of deliberate transmission of infectious diseases (i.e., bioterrorism). The federal Minister of Health or one of her delegates also represents Canada in other international forums—the Asia Pacific Economic Cooperation forum, for example, recently hosted a meeting of health ministers in Thailand to discuss SARS. Finally, to assist developing countries, Canada provides technical advice and support through Health Canada and to a lesser extent, through the Canadian International Development Agency [CIDA]. As noted in Chapter 10, except in HIV/AIDS, CIDA's health portfolio is modest and includes no involvement in emerging infectious diseases. We believe that Canada's international outreach on emerging infectious diseases should be strengthened, thereby providing meaningful support to developing nations and unique learning opportunities for those preparing for careers in public health.

Other international collaborations that have developed as a result of individual contacts and interests among Health Canada staff include the Caribbean Epidemiology Centre, and joint surveillance of enteric pathogens in some Central and South American countries facilitated through the Pan American Health Organization [PAHO].

Unfortunately, Health Canada lacks an overarching strategy for international collaboration and has not prioritized international activities. Recognizing this weakness, PPHB has been collating its international activities over the past six months to inform strategic development. A deficiency that will need to be addressed as part of this process is the lack of an emerging infectious diseases strategy with strong international elements. SARS has illustrated that our borders do not protect us from disease and that we are constantly a short flight away from serious epidemics. Strengthening the capacity of other nations to detect and respond to emerging infectious disease is important from the point of view of enlightened self interest as well as a global responsibility for a country with Canada's resources.

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* A partnership between WHO and Health Canada, the GPHIN is a unique, early-warning, Internet-based system that provides preliminary public health information about global health risks on a real-time, 24/7 basis. From multiple information sources, including global media outlets, GPHIN gathers and disseminates relevant public health information on disease outbreaks. Basic reports are processed by a computer and then human analysts review each report for relevance and accuracy. From approximately 18,000 total monthly reports received, approximately 3,000 are accessed by WHO, which selects the most urgent for verification with the affected country. GPHIN reports approximately 40% of the outbreaks known to WHO. In addition to infectious disease reports, GPHIN covers environmental contaminants, natural disasters, nuclear safety, product recalls and safety, therapeutics, and bioterrorism. Identified news is electronically disseminated to users, who include government and public health officials in Canada and around the world.

11A.2 World Health Organization

In 1948, the United Nations created the World Health Organization. With 192 member countries, WHO's governance structure includes the World Health Assembly (all member states), an Executive Board (32 health experts), and a Secretariat (3,500 staff) headed by a Director-General. In addition to the headquarters in Geneva, WHO operates six regional offices. The organization's global budget is about US$1 billion; a portion of this derives from annual contributions from member countries. Canada's contribution for 2003 was over US$10 million.

Over the last half century, WHO has generally focused on infectious diseases commonly found in developing countries—malaria and tuberculosis, for example. While WHO has engaged in global surveillance of these diseases and has directed specific responses (e.g., immunization campaigns), until recently it lacked the ability to respond to and manage outbreaks. Prior to 2000, WHO employed a relatively passive approach to the international notification of outbreaks of infectious diseases by member states. Data from developing nations were often several years old before their release. Even more importantly, when affected by outbreaks that could potentially have international economic impact (e.g., a reduction in tourism), countries sometimes failed to notify WHO.

The combination of the 1992 Institute of Medicine report on emerging infectious diseases with outbreaks of pneumonic plague in India in 1994 and Ebola in the Congo in 1995 prompted WHO to develop a strategy for more proactive responses. It had (and still has) specified only that plague, yellow fever, and cholera must be reported to WHO by member nations. While formal surveillance efforts are only now being expanded, the partnership with Health Canada to create the GPHIN represented WHO's first step towards a worldwide early warning system for outbreaks. As noted, GPHIN provides global surveillance capacity and bypasses the traditionally slow passage of information from local agencies to national governments and then to WHO. WHO also established the GOARN, a collaboration of over 118 institutions that responds to WHO requests for rapidly mobile teams of experts in infectious disease control within 24 hours of a request by a member state. GOARN has demonstrated its ability to deploy relatively large international teams of epidemiologists, clinicians, statisticians, and logistics personnel in response to outbreaks such as Ebola virus in Gabon and Uganda, severe influenza in Madagascar, and plague in Algeria. Last, during the SARS epidemic, WHO has begun issuing travel advisories for the first time, acting—without explicit authorization by member states—as a trans-national clearinghouse to assess the safety of international travel and, by extension, the effectiveness of outbreak management efforts in different countries. The Committee heard some concern expressed about a situation in which nations such as Canada are expected to 'report to' the WHO, and what this precedent portends for member states more generally.

11B. International Response to SARS

11B.1 WHO Response to SARS

WHO issued an unprecedented global health alert on SARS on March 12, 2003. By this time, SARS had already spread from Hong Kong and Guangdong province of China to Viet Nam, Singapore, Thailand, and Canada.

Very early in the outbreak, WHO established contact with affected countries and offered epidemiologic, laboratory, and clinical support. By March 17, 2003, WHO was coordinating an international multi-centre effort that united 11 laboratories in ten countries to identify the causative agent and develop a diagnostic test. Meanwhile, GOARN teams in Hanoi and Hong Kong were collecting clinical and epidemiologic data as well as helping manage the outbreak; Canada participated actively in the GOARN effort in Hong Kong. Through its regional office in Manila, WHO established logistics bases and supply chains to ensure the rapid provision of protective equipment and medicines.

SARS provided a new challenge for WHO's Communicable Disease Surveillance and Response group—it was a non-focal, multi-country outbreak of a hitherto-unknown disease. As we learned in Chapter 6, close international collaboration on laboratory and epidemiologic aspects was successfully brokered by WHO primarily through teleconferences. It also established a secure web page to facilitate international collaboration.

WHO first issued case definitions for SARS on March 15, 2003. At that time, a suspect case was anyone with fever and respiratory symptoms such as cough or shortness of breath. A probable case was someone with close contact with a person diagnosed with SARS and a history of travel to a SARS-affected area, or a suspect case with x-ray findings of pneumonia. These definitions were refined over the following weeks to more accurately detect and exclude cases. Revised definitions issued on May 1 required the fulfillment of four criteria for a suspect SARS case: fever; cough or shortness of breath; an epidemiologic link (close contact with a suspect or probable case; recent travel or residence in an area where local transmission has occurred); and the absence of an alternative diagnosis. A probable SARS case had all the features of a suspect case plus x-ray, laboratory, or autopsy findings consistent with SARS. WHO was forced to maintain a clinical/epidemiologic definition because no validated, widely available laboratory test for SARS had yet been developed.

We have previously reviewed various criticisms of the SARS case definitions. Even the symptoms that were included in the definition may not have been the most appropriate; an evaluation of the criteria looking specifically at the clinical presentations of Hong Kong patients was published in the *British Medical Journal* on June 21, and it found that the WHO criteria would miss nearly 75% of cases when applied to people presenting early in their course of illness. A further concern has been that the WHO case definition did not distinguish between Toronto, as a so-called "SARS-affected area," and specific exposure sites that were publicized by both provincial and federal public health officials. As noted in Chapter 5, this sometimes led other countries to treat individuals who had visited Toronto or even transited through Toronto's Pearson Airport as potential SARS cases. Other provinces and territories worked with the more specific Health Canada definition rather than viewing everyone from the Greater Toronto Area [GTA] with respiratory symptoms and a fever as a possible SARS case.

Criteria for a new disease inevitably must evolve as information about the disease cumulates. Some confusion was therefore inevitable. However, WHO's criteria meant that records of exported cases used in the WHO assessment for the Toronto travel advisory included individuals who would not have met the Canadian case definition. Rapid contact with countries diagnosing "cases" from Canada usually led to an understanding on both sides. More generally, discrepancies between the WHO definition and those used by individual countries were a recurrent source of confusion in the media.

Only in June at the WHO Global Meeting on SARS in Malaysia did it become clear that many countries had adopted their own case definitions. Surprisingly, this practice was sanctioned by WHO itself. The Committee believes that further attention is needed to determine the respective roles of a body such as WHO and its member states in defining a new disease such as SARS.

11B.2 International Experiences

While the focus in Canada was on the domestic SARS situation, several Asian countries faced even greater challenges in containing their outbreaks. Each outbreak was ultimately controlled through isolating cases, tracing and quarantining contacts, and maintaining vigilance in surveillance efforts. Although SARS seemed to affect the same populations—mainly health care workers, hospital patients, and household contacts—irrespective of country, there were several key differences in how the outbreaks were managed in the various jurisdictions.

Singapore's experience is illuminating as its outbreak was similar in magnitude to that faced in Toronto (see Figure 1). Singapore is a city-state with a population of just over four million, comparable to the GTA. In Singapore, a single hospital was designated as the "SARS hospital," caring for all SARS patients. This hospital liaised with public health in a seamless operation to perform all contact tracing within 24 hours of suspect or probable SARS cases being admitted—a clear contrast with the situation in Toronto.

Those who were placed under quarantine in Singapore received compensation either directly or indirectly from the government. In Canada, only certain employees were eligible for benefits, while those who were self-employed or who did not qualify for benefits suffered from lost income. In Singapore, quarantine orders were issued by a private security company with twice daily calls by videophone. The very few violations that occurred resulted in the use of electronic tracking bracelets. In Toronto, public health staff struggled with massive human resource shortages; at times, they were able to call quarantined individuals only once every three days.

Singapore also benefited from strong leadership with a single point of command-and-control. In fairness, Singapore as a city-state is organized in a much less complex fashion than Canada, where three levels of government were involved in the SARS outbreak. Nonetheless, Dr. Tony Tan, Singapore's Minister of Health, was clearly in charge. He held daily press conferences each morning, where he shared not only facts but also uncertainties and potential worst-case scenarios, along with actions that Singaporeans could and should take to protect themselves and others. In Canada, multiple public health officials, clinicians, and politicians appeared at various times on news broadcasts, variously generating anxiety with mixed messages or over-reassuring the public.

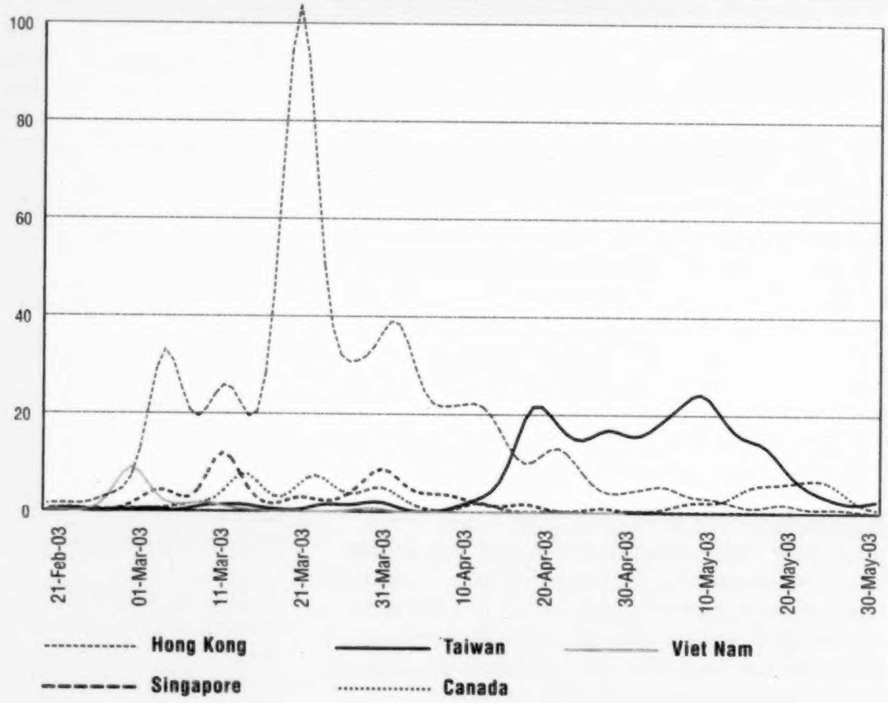
Singapore also conducted active surveillance for fevers and pneumonias among all hospital inpatients, searching for any cases that may have been missed. We believe that the ineffectiveness of such programs in Toronto hospitals contributed to SARS II. Differences in human resources were also evident: Singapore's 1400-bed Tan Tock Seng Hospital had 40 staff carrying out active surveillance, while most hospitals in the GTA, as noted in Chapters 7 and 8, had insufficient staff for ordinary infection control, let alone comprehensive syndromic surveillance.

FIGURE 1

Statistically estimated SARS infection curves of affected areas (except for People's Republic of China).

y axis: expected number of daily new infections, calculated from the SARS epidemic curves by dates of onset of symptoms published by the World Health Organization; x axis: dates of new infections

Source: Ping Yan, Health Canada



11C. Canadian-International Communication and Liaison

Liaison

Liaison with, and transmission of information to and from other countries and international organizations are important functions in the public health system at all times. These tasks are crucial when a public health crisis emerges. Soon after SARS arrived in Canada, Health Canada and the Atlanta-based CDC exchanged one staff member to act as liaison officers. This arrangement lasted several weeks and greatly facilitated interactions between the two bodies. Similarly, a staff person from the Communicable Disease Surveillance Centre of England and Wales was posted to Health Canada's Emergency Operations Centre in Ottawa for a week-long stint.

However, the bulk of SARS cases were in Asia, and experts there were gaining invaluable experience. Many observers felt that Canadian officials failed to connect closely enough with officials in Hong Kong, Singapore and China. One exception occurred when WHO asked scientists from the National Microbiology Laboratory [NML] and the Workplace Health and Public Safety Program to provide technical advice to Hong Kong, specifically at Amoy Gardens, an apartment block where hundreds of residents were infected through a defective sewage system, and also at the Metropole Hotel, the epicentre of the outbreak in Hong Kong. Overall, however, Canada missed out on valuable opportunities to learn from other countries. In contrast, those involved in managing the Singapore outbreak followed the Canadian situation closely. Provincial and municipal representatives from Canada visited Beijing when the Chinese government extended an invitation in the lull between SARS I and SARS II, and Health Canada officials visited Singapore only after the global outbreak was essentially over.

Communication

Although Health Canada regularly transmitted information to WHO during the SARS outbreak, it was unable to supply as much detail as was formally requested.[2] The absence of formal reporting processes between municipal, provincial, and federal governments contributed greatly to deficiencies in data acquisition and sharing. Some experts told the Committee that Canada was simply unable to maintain the confidence of WHO due to incomplete accounting of the outbreak and control measures as well as obvious inter-jurisdictional tensions.

Health Canada officials have stated that they repeatedly asked the Province of Ontario for more detailed information regarding the cases of SARS. A document outlining the initial proposed data elements and the reason for collecting the information was sent to the Ontario Ministry of Health and Long-Term Care [OMHLTC] on April 5, 2003. Besides Health Canada, both WHO and the other provinces and territories within Canada were requesting detailed information. The federal perspective is that Ontario continued to submit incomplete data during the first part of the outbreak, and federal officials often gained new information from Ontario's daily press conference rather than through intergovernmental channels. As noted in Chapter 2, the perspective from the Public Health Branch of OMHLTC is sharply different. During the second phase of the SARS outbreak, it is clear that the disagreements over data flow had largely abated.

The accounts of SARS in Chapters 2 and 5 have demonstrated that the local public health units and the provincial Public Health Branch were overwhelmed by the enormous workload during the SARS outbreak. Simply creating the requisite agreements for sharing data is not enough; capacity must be built at all levels of the public health system to permit a more coordinated response to outbreaks with adequate analysis and reportage.

Although Health Canada designated spokespeople in English and French for SARS, the problem of mixed messages occurred federally as well as provincially. For example, the Canadian Embassy to the United States later complained about the multiple and at times divergent messages coming from Health Canada and the Department of Foreign Affairs and International Trade. They suggested that the departments find a way to centralize incoming and outgoing information, including press releases.

Submissions to the Committee from the travel industry also raised concerns about communications on SARS, indicating significant gaps and inconsistencies with respect to information on SARS available to passengers and staff. Airports were overburdened with calls from the public looking for health-related travel information yet they could not get a coordinated message on SARS from health officials. Some airports and transport carriers retained the services of a medical expert to educate staff on infectious diseases, both to help them do their jobs and to quell their concerns and fears.

The role of the travel industry in communications efforts should also be recognized. Airports indicated that they provided communications equipment and services to Health Canada, provided updates to the airport community by way of bulletins and video records, and also organized and hosted meetings for stakeholders. A number of travel industry stakeholders have called for the establishment of a communication strategy for infectious diseases which includes contact points for the travel industry.

11D. Travel Advisories

11D.1 WHO Advisories

On April 2, 2003, WHO issued a travel advisory recommending the postponement of all but essential travel to Hong Kong and China's Guangdong province. This was the first time the international agency had ever issued such an advisory; previously, only individual countries had issued travel advisories.

On April 23, 2003, WHO added Toronto, Beijing, and China's Shanxi province to the list of areas that travellers should avoid. The advice against non-essential travel to Toronto was scheduled to be in place for three weeks before reappraisal. As we noted in Chapter 2, the reaction of Canadian officials was swift and angry, with politicians and public health officials from multiple levels of government travelling to Geneva to provide documentation that Toronto's outbreak was under control and to request that WHO remove the travel advisory. On April 29, less than a week after the initial announcement, WHO lifted its Toronto advisory.

Recognizing the threat of an emerging infectious disease, WHO apparently felt a need to support and protect less developed countries. The SARS global health alert was predicated on the risk of transmission of the disease to countries that would not have the infrastructure to cope with SARS, and the advisories reinforced this warning. However, the effects of the travel advisories have been profound on the economies of targeted countries. Canadians were particularly frustrated by the difference in concurrent categorization of Toronto by the CDC and WHO, with WHO issuing a more severe warning. Some have suggested that WHO should confine itself to informing countries of the epidemiologic situation in member countries and not issue travel advisories.

The controversies surrounding the WHO travel advisory were augmented by the content of the travel advisory criteria and the communication process leading up to the announcement of the advisory. The criteria seem arbitrary and were developed during the outbreak without a formal consultation process or serious scientific debate. The criteria referred to "prevalent cases" (which apparently included persons with SARS still in isolation), categorically assessed as more or less than 60, more or less than 5 new cases per day on a three day rolling average, and local transmission. The export of SARS to other countries was also considered.

None of these criteria has ever been validated as reasons for issuing a travel advisory. The 60-case threshold has been described as arising "out of the blue". One senior Health Canada official who acted as the liaison with WHO and criticized the criteria, was under the impression that the criteria were still in draft form even as WHO used them to impose the advisory on Toronto and other regions. There are conflicting accounts as to whether warning was given in a telephone call about the impending travel advisory in a conversation among WHO, PAHO, and Health Canada staff about the "affected area" criteria. In any event, within 24 hours of that conversation, a travel advisory had been issued. While there were some brief recriminations between public health officials, one positive effect of the advisory was to create a welcome unity of response among all levels of government.

The Committee can find little rationale for the criteria or the timing of the WHO travel advisory. If WHO is to continue issuing advisories, clear criteria and a process for notice must be developed by agreement among member states.

11D.2 Health Canada Advisories

In Canada, travel advisories are issued by Health Canada's Travel Medicine Program, which assesses the risk for Canadians travelling abroad through information obtained from WHO, GPHIN, the Department of Foreign Affairs and International Trade, and other sources. Three levels of advisories are used: routine advice (i.e., no advisory), defer all non-essential travel, and defer all travel. This system has existed for many years, and advisories have been issued on outbreaks of new and known diseases, as well as natural disasters and hazards, such as bushfires in Australia.

During the SARS outbreak, the major concern was the extent of community spread and the risk that community spread might pose to the Canadian traveller. In addition, as it became clear that hospitals were sources of transmission of SARS, Health Canada became concerned that Canadian travellers with pre-existing medical conditions might have to seek medical care in seriously affected SARS countries, thereby incurring the risk of exposure.

Health Canada used information from WHO on affected area status, and combined this with information collected by GPHIN and other sources to produce a score that was then translated into an advisory. In this scoring system, Health Canada used WHO's categorical labels that were based on the transmission pattern in a particular city or province. These were translated into numbers and averaged for a country, and then an advisory for the country would be generated.

The Committee can find no evidence to suggest that Health Canada's own scoring system has a much firmer grounding than the WHO criteria. By using the WHO "affected area" definitions, Health Canada incorporated criteria into its travel advisories that it criticized when WHO applied them to Toronto. This system was used throughout the outbreak, and led to the issuance of travel advisories for other jurisdictions such as Hong Kong. As one can see in the Table 1, the travel advisories issued by WHO and Health Canada diverged, with the Canadian advisories at times more severe than those of WHO. This and other conflicts between WHO and Health Canada advisories sparked an expression of concern by the Department of Foreign Affairs and International Trade. Canadian missions abroad also were questioned as to the reason why travel advisories from Canada differed to those of WHO.

In short, while many Canadian officials have been critical of WHO over the lack of evidence for its travel advisory criteria, Canada's own practices should be revisited, ideally in the context of a multilateral reassessment of the basis, nature, goals, and impact of advice to travellers.

11E. SARS and Travel Issues

As early as March 15, 2003, WHO issued an emergency travel advisory warning travellers and airline crews to be alert for symptoms consistent with SARS, and they outlined basic procedures for airlines in the event that a passenger or aircrew member became symptomatic in-flight. Later, after its annual World Health Assembly

TABLE 1

Comparison of travel advice against Hong Kong by WHO and Health Canada

Date	WHO	Health Canada
25 March	Recommends no travel restriction to any destination including Hong Kong.	Recommends that people planning to travel to Hong Kong should defer all travel until further notice.
2 April	As a measure of precaution, WHO recommends that persons traveling to Hong Kong consider postponing all but essential travel. This recommendation applies to travelers entering Hong Kong, not to passengers directly transiting through the Hong Kong international airport.	Recommends that people planning to travel to Hong Kong should defer all travel and alternate routing be considered, when possible, if a traveler is transiting through Hong Kong.
13 May		Recommends that people planning to travel to Hong Kong should defer all travel and recommend alternate routing be considered, when possible, if a traveler is transiting through Hong Kong.
15 May		Based on the evidence that the SARS situation had peaked and is confined to certain well defined areas in Hong Kong, Health Canada recommends to defer all elective or non-essential travel to Hong Kong.
23 May	Removes the recommendation that people should postpone all but essential travel (i.e., no travel restriction).	
30 May		Due to the continued concern about limited spread of SARS Health Canada recommends to defer all elective or non-essential travel to Hong Kong.
16 June		Due to the continued concern about limited spread of SARS Health Canada recommends to defer all elective or non-essential travel to Hong Kong.
23 June	Hong Kong removed from the list of areas with recent local transmission, i.e., the chain of human-to-human transmission is considered broken, thus eliminating the risk of infection for both local residents and travelers.	No further mention of any travel restriction against Hong Kong.

meeting in May, WHO's SARS Resolution urged member states to apply their guidelines regarding international travel.

11E.1 Quarantine Act

Under the *Quarantine Act* and Regulations, the federal government exercises its responsibility to help protect Canadians from diseases which might pose a threat to public health through the international movement of people, goods and conveyances (e.g., airplanes, ships, vehicles, etc.). The *Quarantine Act* and Regulations give quarantine officers at Canadian ports of entry and exit the authority to require that a person suspected of having a disease listed in the Act or another dangerous disease undergo a medical examination and to detain that person if necessary. The Act lists four contagious diseases: cholera, plague, yellow fever and smallpox. In keeping with WHO's urging that member nations take the necessary steps to address the SARS outbreak, Health Canada has amended the *Quarantine Act* Regulations. The amendments include adding SARS to the *Quarantine Act*'s Schedule of infectious and contagious diseases; prescribing an incubation period for SARS (20 days); providing quarantine officers with the authority to compel airline carriers on relevant incoming and outgoing flights to distribute SARS health information and questionnaires to all persons on board; and extending the list of airports where an aircraft arriving in Canada must report, before landing, cases of illness or death on board the aircraft.

11E.2 Quarantine Officers

In 2002, Health Canada informed airport authorities that it would be transferring airport quarantine responsibilities to Canada Customs. Customs staff were never trained to do the job. When SARS arrived, Canada had only a tiny contingent of quarantine officers prepared to screen passengers arriving from Asia. A few Health Canada nurses were rapidly trained and dispatched to Toronto and Vancouver to act as quarantine officers by March 18. Later, more officers were deployed to international airports in Montreal, Calgary, and Ottawa. The responsibilities of the quarantine officers have traditionally included assessing passengers and cargo from aircraft, ships, trains, cars, etc., and detaining any person or object suspected of being infected.

During the SARS outbreak, the handful of quarantine officers performed screening, handed out information to travelers, and responded to requests from flight crews, customs, and immigration officers for assistance in the assessment of sick persons on aircraft. Normally in March, 12 to 14 flights arrive from Asia daily, and with the average capacity on each flight being 315 passengers, over 27,000 passengers required screening each week. With the drop in tourism due to SARS during April and May, the volume was reduced to about 19,000 per week. In any case, the quarantine officers were quickly over-extended and eventually needed additional assistance, which was provided by local public health authorities and Health Canada's regional First Nations and Inuit Health Branch office.

Airport authorities made submissions expressing concern about Health Canada's ability to mobilize knowledgeable quarantine staff to the airports, to provide logistical support, and to manage communications to their own staff, the airports, air carriers, and the public. Airport authorities clearly felt that Health Canada quarantine staff were sent into the situation with limited briefing and little or no supporting materials.

11E.3 Screening Measures and Provision of Health Information

Screening of incoming air passengers was started as an initial response to prevent importation of SARS. (Appendix 11.1 provides a chronology of airport screening in Canada.) Passengers from Asia were "visually screened" and greeted with yellow Health Alert Notices providing instructions on how to self-monitor for SARS symptoms; they were also required to provide contact information to allow public health officials to trace them in the event that a fellow passenger was diagnosed with SARS. Posters with pertinent information about SARS were placed in strategic locations around the airports.

On March 27, 2003, WHO recommended that areas with local transmission of SARS institute measures to screen departing travelers. Health Canada responded by providing cherry-coloured Health Alert Notices identical to those being provided for incoming travelers.

In May, as part of the understanding that led WHO to rescind its travel advisory, the federal government agreed to institute further exit screening of air travelers. The information cards for both arriving and departing travelers were revised to include a set of screening questions* in an effort to detect symptomatic individuals. Anyone who answered "yes" to any of the questions was interviewed by Health Canada screening nurses; and any possible SARS cases would be promptly isolated and transferred to health facilities for further evaluation. WHO also suggested that the use of thermal scanners be considered. One machine was graciously loaned to Canada by Singapore, and others acquired as part of a pilot project to test the technology. These machines were installed in Toronto and Vancouver to detect travelers with fever.

In submissions to the Committee, airport authorities in both Vancouver and Toronto were critical of Health Canada's organizational ability and operational capacity in managing travel screening. The Vancouver International Airport Authority submission to the committee noted, for example, that Health Canada officials repeatedly referred to a "contingency plan" that "had never progressed beyond the draft stage and appeared to (have been) abandoned." They also noted that the language barriers of many travelers were not appropriately addressed; information should have been provided in Chinese as well as English and French.

As of August 27, 2003, an estimated 6.5 million screening transactions occurred at Canadian airports to aid in the detection and prevention of SARS transmission. Roughly 9,100 passengers were referred for further assessment by screening nurses or quarantine officers. None had SARS. Over 3.2 million arriving passengers were screened using yellow cards; compliance was close to 100% because of the mandatory review by Customs officials. Over 990,000 outbound passengers were screened at Toronto's Pearson international airport using cherry cards. Audits conducted by Health Canada staff demonstrated that there was also a high rate of compliance with cherry cards; over 90% of departing international passengers indicated that they had received the cards and had been asked health-related questions at check-in by airline staff.

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* Do you have a fever? Do you have one or more of the following symptoms: cough, shortness of breath or difficulty breathing? Have you been in contact with a SARS-affected person in the last 10 days?

The pilot thermal scanner project included most inbound and outbound international passengers at Toronto's airport, and all passengers on inbound flights from Asia, as well as a sample of three outbound international flights daily at Vancouver's airport. Almost 2.4 million passengers were screened by late August, the vast majority in Toronto. Only 832 required further assessment, and again none were found to have SARS. More detailed statistics are provided in Appendix 11.2.

In other countries, the yields for airport screening measures were similarly low. An evaluation of airport screening in Beijing revealed that despite screening over 275,000 travelers between April 24 and June 20, only 0.2% were determined to have fever. None had SARS. In Singapore, 30,000 passengers were screened each day, with about 60 of those assessed further. Again, none had SARS. Only in Hong Kong did airport screening yield any SARS cases—after screening millions of travelers with thermal scanners, two SARS cases were found.

These results are not surprising. Screening for a rare disease like SARS in a large population (i.e., millions of travelers) is both difficult and ineffective with an extremely low likelihood of actually detecting cases. Also, travel screening fails to detect those who may be incubating the disease—these individuals would still be symptom-free. Screening healthy people for infectious diseases should be based on certain premises: that a disease is present in the general population, that it can be detected by screening measures, and that there is a high risk of transmission by asymptomatic individuals. None of these conditions were met by SARS. In the absence of such features, screening healthy people is expensive, possibly highly intrusive, and can create a false sense of security or needless anxieties.

The claim that screening bolsters business confidence has been promoted by various countries at international forums. Given the available data, screening appears to be more about conformity than logic or evidence, with no country prepared to take the first step of abandoning these measures. Furthermore, any measures implemented at airports should theoretically be replicated at ports and at land border crossings. In Canada, with 18 land border crossings with the US, this was impossible. Instead, replicating the CDC's action, information cards were provided to an estimated 200,000 vehicles per month entering Canada.

Formal screening may be difficult to justify, but provision of timely and practical health information to travelers is much less expensive and based on the defensible assumption that the vast majority of persons are rational and well-intentioned, and can make intelligent risk assessments. The benefit of providing health information to travelers has been demonstrated in at least one anecdotal report of a person who arrived in British Columbia from an affected area and was subsequently diagnosed as having SARS. He developed symptoms one to two days after arrival, isolated himself as instructed on the yellow Health Alert Notice, and was admitted to hospital where isolation precautions were strictly followed. There was no secondary spread from this case.

11E.4 Protocols for Airlines and Cruise Ships

At one point early in the SARS outbreak, a traveler who exhibited SARS-like symptoms arrived in Vancouver; Health Canada invoked the *Quarantine Act* to stop the aircraft from departing until it had been properly decontaminated. However, Health Canada officials were unable to advise the airline as to the requirements for adequate decontamination because they were still unsure of the cause of SARS. Protocols for aircraft and airlines were not developed until the end of April. These outlined the appropriate cleaning agents and protective measures to be used when decontaminating an aircraft that had carried a potential SARS case. Health Canada's protocols for screening, handling of SARS cases, and cleaning cruise ships were released in mid-June.

Related problems encountered during the SARS outbreak were jurisdictional disagreements between federal and local officials, as well as between local health authorities, with regards to airports and ports situated within the geographic boundaries of local health units. For example, University of British Columbia [UBC] Hospital in Vancouver was designated as the facility for SARS patients; however, the airport was located in the suburb of Richmond and therefore part of a different health region. Travelers with SARS-like symptoms were allegedly examined in the parking lot to determine whether they should be transported to the UBC Hospital or to the local Richmond Hospital.

In all these instances, business processes can be developed to anticipate difficulties and ensure the faster implementation of containment, decontamination, or referral protocols.

11F. Recommendations

Having regard to the international issues reviewed above, the Committee recommends that:

11.1 The Government of Canada should take the lead, along with an international consortium of committed partners, in the detection of global emerging diseases and outbreaks. This should be done through enhancements to the Global Public Health Intelligence Network and similar programs.

11.2 The Canadian Agency for Public Health should have a mandate for greater engagement internationally in the emerging infectious disease field, including the initiation of projects to build capacity for surveillance and outbreak management in developing countries.

11.3 The Canadian Agency for Public Health should be the institution responsible for direct communication with the World Health Organization, the US CDC, and other international organizations and jurisdictions. The Agency should disseminate within Canada information received from international organizations and jurisdictions on global health threats, and in turn, it would inform the World Health Organization and other jurisdictions of relevant Canadian events. During outbreak situations, the Agency would perform the role of liaising between Canadian and international organizations and jurisdictions to maximize mutual learning.

11.4 The Government of Canada should review its travel screening techniques and protocols with a view to ensuring that travel screening measures are based on evidence for public health effectiveness, while taking into account the financial and human resources required for their implementation and sustained operation. The Government of Canada should also initiate a multilateral dialogue with other nations that are currently engaged in SARS travel screening to determine whether and when some or all of these measures should be modified or discontinued.

11.5 The Government of Canada should seek the support of international partners to launch a multilateral process under the auspices of the World Health Organization that would set agreed-upon standards of evidence for the issuance of travel advisories and alerts by member states. The multilateral process should also seek to determine the role of WHO in issuing travel advice, and to establish a procedure for providing advance notice for possible alerts and advice. The notice process should provide a mechanism for consultation with and a response by the target country.

11.6 The Government of Canada should ensure that an adequate complement of quarantine officers is maintained at airports and other ports of entry, as required. Fully trained and informed quarantine officers should be available at airports to deal with health threats, to provide information to and educate airport staff, customs officials, and airline personnel concerning the recognition of illness and measures to be taken to contain risk. Close collaboration with airport authorities and airline personnel to clarify responsibilities in the event of a health threat is necessary.

11.7 The Government of Canada should ensure that incoming and outgoing passengers are provided with health information about where and when health threats exist, including any precautionary measures to take, how to identify symptoms of the disease, and what first steps to take in case of suspected infection. A partnership with the travel industry would facilitate this process so that information could be provided at the time of bookings. The current Health Canada web site containing information for travelers should be made more prominent and its existence promoted.

11.8 All federal/provincial/territorial/municipal response plans shouid include port/cruiseship- and airport/airplane-specific protocols for infectious diseases as well as protocols for employee protection guidelines and decontamination of aircraft, ships, and/or facilities. Jurisdictional issues concerning travel and health need to be resolved through the plan. The plan should be developed with input and buy-in from local health officials, response agencies, ports, airports and the relevant companies in the shipping and airline industries.

References

1. Institute of Medicine, "Emerging Infections: Microbial Threats to Health in the United States", January 1, 1992. Accessed on Aug 4 2003 at http://www.iom.edu/report.asp?id=4572.
2. World Health Organization, Weekly Epidemiologic Record, 2003, 78 (14): 102-105.

Appendix 11.1
A Chronology of SARS Travel Screening

Chronology - SARS Screening (2003)

February 24	SARS arrives in Canada carried by individual returning from Hong Kong
March 12	WHO issues global alert on "mysterious virus-pox" epidemic in China
March 13	Health Canada notified of several cases of atypical pneumonia in Ontario
March 18	Quarantine Officers deployed. HC begins distribution of "Health Alert Notices" to travelers arriving in & returning to Canada from Asia at Pearson and Vancouver airports
March 21	Yellow health information cards distributed to major airports in Canada
March 24	HC deploys personnel to Dorval for increased screening of incoming passengers
March 27	WHO recommends SARS-affected areas with known transmission to institute measures to identify international passengers with symptoms. Also issues recommendations to airlines regarding suspected cases in-flight
April 3	Distribution of cherry cards for passengers departing Pearson on international flights implemented – expands to Toronto Island Airport and train stations April 7
April 9	In-flight distribution of Yellow cards and contact forms begin on 9 airlines with flights from Asia
April 23	WHO travel advisory in place for Toronto, lifted April 30
May 7	Thermal scanner on loan from Singapore operational at Pearson
May 14	Toronto removed from WHO's list of areas with local transmission. Returned to list May 26 and removed again on July 2
May 16	Distribution of revised Yellow health alert cards (with questions) begins at Toronto and Vancouver for international travellers on all Asian airlines bringing passengers into Canada and Air Canada (flights from Asia)
May 16	Distribution of revised Cherry cards (with questions) for outbound flights begins at Toronto for 5 international airlines. Six Thermal Scanners set up in Vancouver airport for all incoming international travelers (subsequently reduced to 5 due to malfunctioning equipment)
May 23	Six Thermal scanners set up in Toronto Pearson airport for all incoming and outgoing international travelers
June 2	Start distribution of Cherry cards for all outbound international airlines from Toronto
June 6	Yellow card screening in place for all international flights into Toronto and Vancouver and at 18 land-border crossings from the U.S.
June 10	HC's protocol for cruise ships posted online
June 12	Amendments to the *Quarantine Act* and Regulations come into effect
June 14	Yellow card screening in place for all international flights arriving in Toronto, Vancouver, Calgary, Montreal and Ottawa

Appendix 11.2
SARS Screening Measures - Daily Report *August 27, 2003 (end-of-day)*

Measure	Location	Daily Report			Cumulative Report			Comments
		Screened	Further Assessed	Results	Screened	Further Assessed	Results	
Cherry Cards - outbound	Toronto	10,074	7	all cleared	992,720	792	all cleared	All international flights flying from all terminals now using "Cherry Card" process. August 8-12 audit findings of 1,302 passengers: 93% of people surveyed (1,210) at Pearson responded they received a cherry card. 80% responded they had been asked health-related questions at check-in. Follow-up with airlines not fully complying.
Yellow Cards - inbound	Toronto	15,217	33	all cleared	1,091,709	3,158	all cleared	All international flights arriving daily in Toronto (70+ airlines), Vancouver (100+ airlines), Ottawa (13+ airlines), Calgary (20+ airlines), Dorval and Mirabel (23+) have yellow-card screening in place. Vancouver data to date only reports Asian airline arrivals. We are compiling past records to update this information for all airlines.
	Vancouver	4,118	24	all cleared	1,137,526	2,111	all cleared	
	Vancouver	2,774	16	all cleared	282,425	888	all cleared	
	Vancouver	6,602	15	all cleared	629,599	1,103	all cleared	
	Ottawa	1,188	2	all cleared	61,768	236	all cleared	
	Yellow Card Subtotal	***29,899***	***90***		***3,203,027***	***7,476***	all cleared	
TOTAL ALL CARDS		**39,973**	**97**	**all cleared**	**4,195,847**	**8,268**	**all cleared**	
Scanners (pilot project)	Toronto	25,291	4	all cleared	2,051,141	791	all cleared	2 companies operating: FLIR (3) and Thermal Imaging Inc (3), all static: • Terminal 1 (2 machines - inbound and outbound) • Terminal 2 (2 machines - inbound and outbound) • Terminal 3 (2 machines - inbound and outbound) • Hrs of operation per airline schedules. Shifts covering 8:30 a.m.- 9:00 p.m.
	Vancouver	4,714	1	all cleared	310,745	41	all cleared	2 companies operating: Mikron (3) FLIR (3): • 1 FLIR machine is hand-held. • Hrs of operation per airline schedule. Shifts covering 7:00 a.m.-11:00 p.m.
TOTAL ALL SCANNERS		**30,005**	**5**	**all cleared**	**2,361,886**	**832**	**all cleared**	Scanner leases have been extended to Sept. 16th.
Video	All airlines (with the exception of Air Canada and Philippine Airlines) are showing the video.	7 of 9 airlines from SARS-affected areas flying into Toronto & Vancouver have copy of video						Videos were sent to Air Canada on July 31. Videos were sent to Philippine Airlines on July 7th. We have received confirmation from Air Canada that they will start showing the videos beginning August 9. Philippine Airlines received their copies via the Canadian Consul office in late July. They expect to be playing them by mid-August.
Land Borders	Approximately 200,000 vehicles per month are receiving yellow cards at 18 land-border crossings							
GRAND TOTAL ALL SCREENING MEASURES =	5,753,185							
5,753,185	represents the total passenger screening transactions: some people will have been screened twice (with cherry/yellow cards and then with thermal temperature scanners)							

Chapter 12

LEARNING FROM SARS: Renewal of Public Health in Canada

SARS has demonstrated the speed with which a dangerous new disease can emerge and spread around the planet. The seriousness of the outbreak and the challenges that arose in containing SARS are widely and rightly regarded as signposts for the need to strengthen Canada's public health systems.

In fact, the evidence of actual and potential harm to the health of Canadians from weaknesses in public health infrastructure has been mounting for years without a truly comprehensive and multi-level governmental response. Canada has faced the HIV epidemic, water contamination in Walkerton, Ontario and North Battleford, Saskatchewan, and threats to the safety of Canadian blood supplies from HIV and Hepatitis B and C. The events of September 11, 2001 and the related anthrax attacks on our US neighbour heralded the possibility of bioterrorism within our borders. Recently, one part of the country has faced economic hardship caused by fears of the spread of BSE from cattle to humans, while others are trying to stem the spread of West Nile virus from birds to humans. And as this report goes to press, a new public health crisis is unfolding around a meat packing plant in Aylmer, Ontario.

All these events have represented tangible threats to the physical and economic well-being of Canadians. All these threats emphasize the need for a seamless public health system. At minimum, Canadians expect that the nation's public health systems should be fully prepared to deal with emergencies caused by infectious diseases, accidental or intended, and consistently be able to protect them from mass contamination of water or food. These minimal expectations are not being met.

As a disease outbreak, SARS was relatively small. Nonetheless, the disease killed 44 Canadians, and caused illness in a few hundred more. The response to the outbreak paralyzed a major segment of Ontario's health care system for weeks, and saw more than 25,000 residents of the Greater Toronto Area placed in quarantine. Psychosocial effects of SARS on health care workers, patients, and families are still being assessed, but the economic shocks have already been felt. Estimates based on volumes of business compared to usual seasonal activities suggest that tourism sustained a $350 million loss, airport activity reduction cost $220 million, and non-tourism retail sales were down by $380 million. It seems entirely possible that the direct and indirect costs of SARS could reach $2 billion.

As Canada recovers from this extraordinary set of events, the National Advisory Committee on SARS and Public Health has been weighing what lessons might be learned from the outbreak of SARS in Canada. The foregoing chapters indicate that there was much to learn—in large part because too many earlier lessons were ignored. We are confident that related work by other individuals and groups—including the Senate Standing Committee chaired by the Hon. Michael Kirby, the expert panel in Ontario chaired by Dr. David Walker, and the public health investigation by Mr. Justice Archie Campbell—will lead to many lessons beyond those drawn here. Those ongoing assessments, however, must not be used by governments as an excuse for inaction and delay.

Before recapitulating the recommendations from earlier chapters, some themes and issues from the body of this report may be worthy of review.

Our first theme is that the single largest impediment to dealing successfully with future public health crises is the lack of a collaborative framework and ethos among different levels of government. If the experience of SARS in Ontario were to be repeated in a jurisdiction with fewer resources and a smaller base of highly-skilled and dedicated personnel, or in the face of a more virulent infectious disease, the consequences could be disastrous. Canadians expect to see their governments collaborate responsibly in the face of a serious threat to the health of the population. The rules and norms for a seamless public health system must be sorted out in advance of a health emergency, with a spirit of partnership and shared commitment to the health of the citizenry, not on an *ad hoc* basis in the midst of the battle to contain a viral outbreak.

Systems-based thinking and coordination of activity in a carefully-planned infrastructure are not just essential in a crisis; they are integral to core functions in public health because of its population-wide and preventive focus. To repeat an observation from an earlier chapter: the Committee does not seek to build public health systems so perfect that people no longer need to be good. But we believe Canadians should demand a set of interlocking public health systems sufficiently strong that bad things do not happen needlessly to good people. The case for a collaborative and coordinated approach to public health is arguably even more acute than in our still-fragmented personal health services systems. Weakness in health protection or disease control in one jurisdiction will rapidly affect many other jurisdictions. To that end, the Committee has recommended strategies that will strengthen all levels of the public health system as well as integrate the components more fully with each other.

The Committee appreciates that F/P/T relations are not straightforward in Canada (or any other federation). That, in large part, is why we have proposed new structures and funding mechanisms that aim to remove public health from the jurisdictional cross-fire. The Committee nonetheless strongly urges current and future governments to view public health as a 'constructive-engagement zone' in F/P/T relations for several reasons.

First, public health threats have generalized impacts. The success of Ontario and British Columbia in containing SARS spared the rest of the country. We cannot afford to have any weak links in a pan-Canadian chain of health protection and disease control.

Second, public health costs are modest—perhaps 2-3% of health spending, depending on how one defines numerators and denominators. The actual amount of new federal spending that the Committee has recommended would reach $700 million per annum by 2007. This is what F/P/T governments currently spend on personal health services in Canada between Monday and Wednesday in a single week.

Third, the Committee's recommendations for new funding are oriented to supporting all jurisdictions. Until now, there have been no federal transfers earmarked for local and provincial/territorial [P/T] public health activities. Public health has instead been competing against personal health services for health dollars in provincial budgets, even as the federal government has increasingly earmarked its health transfers for specific health service priorities. About 75% of the new federal spending that we have recommended will flow to support local and provincial/territorial public health activities. This includes $300 million per annum for front-line public health activities under the new Public Health Partnerships Program, $100 million per annum to support P/T purchase of costly new vaccines under a reinvigorated National Immunization Strategy, and $100 million in a Communicable Disease Control Fund to support second-line defences at the P/T level and link P/T and federal centres of excellence in surveillance, prevention, and containment of infectious threats to health. Furthermore, the new Canadian Agency for Public Health would make significant new investments in health human resources, research, and surveillance for non-communicable diseases—all of which will have direct benefits for P/T jurisdictions.

Fourth and finally, the fiscal and strategic approaches set out in this report are entirely consistent with international precedents and, we believe, the expectations of Canadians. Similar programs of transfers for public health to states and territories exist in Australia and also operate under the auspices of the Centers for Disease Control and Prevention [CDC] in the USA. Public health authorities in the European Community are building capacity to coordinate health protection and facilitate networking among national foci for disease control. With the globalization of health threats and growing importance of international collaboration in disease control, the Committee urges F/P/T governments to coalesce around public health as a pan-Canadian priority.

We turn back now to the Committee's recommendations.

The first section consists of a series of recommendations that require urgent attention by governments as part of preparation for the winter season and the associated increases in the incidence of respiratory viral illnesses. They are largely self-explanatory.

The sections thereafter recapitulate recommendations presented in the body of the report. Arguments in support of each recommendation were given in the relevant chapter. For brevity, we do not repeat the rationale for the recommendations or elaborate on them below.

While the Committee is providing its advice and recommendations to the federal Minister of Health, public health broadly and health emergencies more specifically are national issues that require pan-Canadian collaboration and involvement. No one level of government has sole responsibility over all aspects of public health. And, given the roles and experiences of various Committee members, we believed it would be a dereliction of responsibility for us to focus very narrowly on federal issues. Therefore, by necessity, we present recommendations or sub-recommendations that apply to jurisdictions in addition to or other than the federal government.

Among these are recommendations that deal with the personal health services sector and aspects of local public health arrangements where P/T jurisdiction is relatively clear. Most of these were first set out in Chapter 8. The information and evidence bearing on those recommendations was carefully collected, albeit primarily from one large province. We repeat these recommendations in the hope that they may be useful to all P/T jurisdictions.

A further caveat is that many of the recommendations apply to public health broadly. Infectious diseases are an essential piece of the public health puzzle, but cannot be addressed in isolation, particularly since in local health units, the same personnel tend to respond to both infectious and non-infectious threats to community health. Furthermore, the success of health emergency planning and outbreak management is dependent upon a broad and solid public health foundation. Implementation of these recommendations should therefore greatly enhance the capacity of Canada's public health systems to respond to infectious diseases or other health emergencies, while simultaneously renewing the general public health infrastructure and its ability to protect and improve the health of Canadians.

12A. Preparing for the Respiratory Virus Season

As Canada recovers from SARS, preparations must begin for the next respiratory virus season. SARS may or may not re-emerge; however, even if it does not, the public health system and the health care system will be forced to respond to many false alarms. While many of the initiatives needed to renew the public health system will require months or years of hard work, there are some areas that, in the Committee's view, require attention over the next three months.

- A national manual for the investigation and control of SARS outbreaks should be completed. Parts of this manual exist in Health Canada guidelines, and in Ontario and British Columbia directives and guidelines. A coordinated and detailed package needs to be available to hospitals and public health units across the country. Health Canada funding and a secretariat, as well as P/T cooperation and collaboration, will be necessary.
- In addition to a comprehensive technical manual for outbreak containment, Health Canada should coordinate the development of an educational package about routine practices, SARS, and SARS surveillance for the coming winter season that can be distributed to hospitals, programs and institutions involved in educating health professionals, and various professional associations and stakeholder groups for use in training front-line staff.
- The F/P/T Conference of Deputy Ministers should immediately designate lead public health officials to develop guidelines for federal, provincial, local, and institutional roles and responsibilities during an outbreak of SARS or similar agent. This work would be antecedent to more comprehensive and longer-term development of intergovernmental agreements on public health roles and responsibilities. It should specify the roles of institutions and various levels of government in both domestic and international elements of responding to SARS.
- Real-time alert systems for SARS and similar respiratory illnesses need to be created and coordinated. This includes: mechanisms for rapid reporting of activity within Canada to Health Canada, mechanisms for informing Canadians rapidly of developments in other jurisdictions, and mechanisms for prompt communication of the evolving scientific data from Canada and other parts of the world. The alert systems must extend to all health care facilities and, to the greatest extent possible, should also reach primary care providers.

- National recommendations on surveillance for SARS should ideally be completed by mid-October. Primary care providers require guidelines for assessment and referral of respiratory illnesses, given the high volume of such patients in their offices during the winter months. Definitive diagnoses will generally be made in emergency departments and hospitals. Hence, for clarity of responsibility, surveillance planning should be led by the Nosocomial and Occupational Infections Section within the Centre for Infectious Disease Prevention and Control [CIDPC] with input from other key divisions. The surveillance strategy should include recommendations for appropriate laboratory testing for SARS and other viral pathogens, a manual of definitions and procedures, and a software program for data entry at the hospital level for reporting to local public health units.
- The National Microbiology Laboratory, through the Canadian Public Health Laboratory Network, should establish guidelines for the necessary laboratory capacity across the country. Provincial ministries of health should coordinate provincial and hospital laboratory resources to ensure that adequate capacity for SARS and other viral testing is available by mid-November, and that clinicians are educated as to what specimens are needed, how they should be sent, and the timeframe for reporting of results.
- Health Canada should work ahead of the Health Emergency Response Team [HERT] framework to create, organize, and resource two national epidemic response teams. Their roles, responsibilities and reporting structure need to be negotiated with the provinces and territories, with due consideration given to the needs and responsibilities of the local public health units and other institutions or agencies that the teams would be sent to assist.
- A full research evaluation and publication of the effectiveness of passenger screening on the detection of 'importation and exportation' of SARS should be completed as soon as possible. Health Canada should share these results with other jurisdictions that are performing passenger screening antecedent to the multilateral dialogue on passenger screening recommended below.
- International technical liaison offices, at a minimum with the World Health Organization [WHO] and the US CDC, should be established for the National Microbiology Laboratory and the CIDPC. Protocols for the exchange of liaison officers during epidemics must be negotiated.
- Health Canada should coordinate an open scientific meeting late in the Fall, with objectives that include: updating Canadians on the science of SARS, discussing plans for SARS surveillance for the winter season, and reviewing the roles of travel advisories and passenger screening.

12B. Recommendations for Renewal of Public Health in Canada

12B.1 New structures for Public Health

- The Government of Canada should move promptly to establish a Canadian Agency for Public Health, a legislated service agency, and given it the appropriate and consolidated authorities necessary to provide leadership and action on public health matters, such as national disease outbreaks and emergencies, with or without additional authorities regarding national disease surveillance capacity.
- The Government of Canada should ensure that the scope of the Agency's mandate covers public health broadly with appropriate linkages to other government departments and agencies engaged in public health activities. The Government's scoping exercise for the new Agency must be informed by a careful review of public health service provision and health promotion for First Nations and Inuit Canadians.
- The architects of the new Canadian Agency for Public Health should ensure that its structure follows a hub and spoke model whereby links are made to existing regional centres with particular strengths in public health specializations while some other functions and new ones are devolved to other regions of the country, with a vision that these parts support the entire system.
- The Government of Canada should create the position of Chief Public Health Officer of Canada. The Canadian Agency for Public Health should be headed by the Chief Public Health Officer of Canada who would report directly to the federal Minister of Health and serve as the leading national voice for public health, particularly in outbreaks and other health emergencies.
- The Government of Canada should create the National Public Health Advisory Board, and ensure that nominations of board members come forward through provincial and territorial as well as federal channels. The mandate of the Board will be to advise the Chief Public Health Officer of Canada on the development and implementation of a truly pan-Canadian public health strategy.

- The F/P/T Conference of Deputy Ministers of Health should initiate a new Network for Communicable Disease Control that would link F/P/T activities in infectious disease surveillance, prevention, and management. This initiative should be started as soon as possible, and integrated with the existing F/P/T Network for Emergency Preparedness and Response.
- The Canadian Agency for Public Health should create a Public Health Ethics Working Group to develop an ethical framework to guide public health systems and health care organizations during emergency public health situations such as infectious disease outbreaks. In addition to the usual ethical issues, the Working Group should develop guidelines for collaboration and co-authorship with fair apportioning of authorship and related credit to academic participants in outbreak investigation and related research, and develop templates for expedited ethics reviews of applied research protocols in the face of outbreaks and similar public health emergencies.

12B.2 New Funding for Public Health

- The Government of Canada should budget for increases in core functions of the new Canadian Agency for Public Health that will rise, over the next 3 to 5 years, to a target of $200 million per annum in incremental funding beyond that already spent on core federal public health functions.
- The Government of Canada should fund a new Public Health Partnerships Program under the auspices of the Canadian Agency for Public Health. The Agency would thereby provide program funding to provinces and territories to strengthen their public health programming in agreed areas and in support of the National Public Health Strategy. The funding for the Public Health Partnerships Program should rise over 2-3 years to $300 million/annum.
- Through the Canadian Agency for Public Health, the Government of Canada should invest $100 million/annum within 12 to 18 months to realize the National Immunization Strategy whereby the federal government would purchase agreed-upon new vaccines to meet provincial and territorial needs and support a consolidated information system to track vaccinations and immunization coverage.
- Under the aegis of the new Canadian Agency for Public Health, the Government of Canada should budget for a Communicable Disease Control Fund, allocating a sum rising over 2-3 years to $100 million per annum in support of provincial, territorial, and regional capacity for infectious disease surveillance, outbreak management, and related infection control activities, including the sponsorship of a new F/P/T network. Initial allocations from this Fund should be made to facilitate immediate preparedness for a possible return of SARS to Canada during the winter season of respiratory illnesses and influenza.

12B.3 National Public Health Strategy

- The Canadian Agency for Public Health should play a catalytic role in developing a National Public Health Strategy in collaboration with provincial and territorial governments and in consultation with a full range of non-governmental stakeholders. The new Strategy should delineate priorities and goals for key categories of public health activity along with provisions for public reporting across jurisdictions of progress towards achieving goals.
- The Government of Canada should incorporate into the new Agency the current grants and contributions programs of the Population and Public Health Branch of Health Canada. These grants and contributions should be reviewed and their uses aligned with the National Public Health Strategy and made complementary to the Public Health Partnerships Program.

12B.4 Emergency Planning, Outbreak Management and Crisis Communications

- The F/P/T Network for Emergency Preparedness and Response, in collaboration with the new F/P/T Network for Communicable Disease Control, should urgently move ahead with the development of a comprehensive approach to managing public health emergencies through a pan-Canadian system that includes:
  - harmonizing emergency preparedness and response frameworks at the federal, provincial and territorial levels;
  - developing seamless planning and response capacities as envisaged by the 31 recommendations of the Special Task Force on Emergency Preparedness and Response;
  - building an integrated F/P/T planning, training and exercising platform for responding to all-hazard disasters, including public health emergencies created by large scale disease outbreaks;
  - developing and applying a common set of principles, concepts and capabilities for large scale disease outbreaks; and
  - creating the requisite linkages to major employers, the travel and hotel industry, and relevant NGOs.

- Health Canada in collaboration with provincial/territorial jurisdictions should lead the development of a national legislative and policy framework for a measured, harmonized, and unified response to public health emergencies.
- As part of Health Canada's legislative renewal process currently underway, the Government of Canada should consider incorporating in legislation a mechanism for dealing with health emergencies which would be activated in lockstep with provincial emergency acts in the event of a pan-Canadian health emergency.
- F/P/T governments should develop and provide training programs and tools to support local public health units and institutions in systematically developing, implementing, and evaluating crisis and emergency risk communication strategies.
- The F/P/T Conference of Deputy Ministers of Health should support the continued activity of the F/P/T Network for Emergency Preparedness and Response with a view to enhanced surge capacities in all jurisdictions, including:
  - developing an integrated risk assessment capability for public health emergency response;
  - assessing the National Emergency Stockpile System [NESS] to optimize its role in supporting the response to large-scale disease outbreaks; and
  - developing and funding the Health Emergency Response Team concept, including a psychosocial response component, as a practical, flexible mechanism for addressing the need for human resource surge capacity.

12B.5 Surveillance/Data Gathering and Dissemination

- The Canadian Agency for Public Health, in partnership with the new F/P/T Network for Communicable Disease Control, should give priority to infectious disease surveillance, including provision of technical advice and funding to provincial/territorial jurisdictions and programs to support training of personnel required to implement surveillance programs. The Agency should facilitate the longer-term development of a comprehensive and national public health surveillance system that will collect, analyze, and disseminate laboratory and health care facility data on infectious diseases and non-infectious diseases to relevant stakeholders.
- Assuming some lag time to inception of a new Agency or F/P/T Network, Health Canada and the provinces and territories should urgently commence a process to arrive at business process agreements for collaborative surveillance of infectious diseases and response to outbreaks. (This work dovetails with the above-noted SARS surveillance initiative for the Fall of 2003). The business processes for infectious disease surveillance would be extended over time with support from the Agency's Centre for Surveillance Coordination and the Public Health Partnerships Program, to a national system for non-communicable diseases and population health factors.
- The Government of Canada should seek the establishment of a working group under the auspices of the Canada Health Infoway Incorporated and Health Canada and/or the new Canadian Agency for Public Health, to focus specifically on the needs of public health infostructure and potential investments to enhance disease surveillance and link public health and clinical information systems.

12B.6 Clarifying the Legislative and Regulatory Context

- The Government of Canada should launch an urgent and comprehensive review of the application of the *Protection of Information Privacy and Electronic Documents Act* to the health sector, with a view to setting out regulations that would clarify the applicability of this new law to the health sector, and/or creating new privacy legislation specific to health matters.
- The Government of Canada should launch a comprehensive review of the treatment of personal health information under the *Privacy Act*, with a view to setting out regulations or legislation specific to the health sector.
- The Government of Canada should embark on a time-limited intergovernmental initiative with a view to renewing the legislative framework for disease surveillance and outbreak management in Canada, as well as harmonizing emergency legislation as it bears on public health emergencies.
- In the event that a coordinated system of rules for infectious disease surveillance and outbreak management cannot be established by the combined effects of the F/P/T Network for Communicable Disease Control, the Public Health Partnerships Program, and the above-referenced intergovernmental legislative review, the Government of Canada should initiate the drafting of default legislation to set up such a system of rules, clarifying F/P/T interactions as regards public health matters with specific reference to infectious diseases.

12B.7 Renewing Laboratory Infrastructure

- The F/P/T Conference of Deputy Ministers of Health should urgently launch an expedited review to ensure that the public health laboratories in Canada have the appropriate capacity and protocols to respond effectively and collaboratively to the next serious outbreak of infectious disease. The review could be initiated through the Canadian Public Health Laboratory Network and engage with the new F/P/T Network for Communicable Disease Control as soon as the latter is operational.
- Health Canada, in collaboration with the relevant provincial/territorial authorities, should urgently initiate the development of a laboratory information system capable of meeting the information management needs of a major outbreak or epidemic. The laboratory information system must be designed in such a way as to address the functional needs of laboratories, be readily integrated with epidemiologic information, and be aligned with data-sharing agreements across jurisdictions and institutions.
- The F/P/T Conference of Deputy Ministers of Health should launch a full review of the role of laboratories in national infectious disease surveillance systems, with the aim of creating a more efficient, timely, and integrated platform for use of both public and private laboratories in surveillance.
- The Government of Canada, through the Canadian Agency for Public Health, should invest in the expansion of the Canadian Public Health Laboratory Network to integrate hospital and community-based laboratories. This includes alignment of incentives and clarification of roles and responsibilities for infectious disease control. The relevant monies could flow from the Public Health Partnerships Program or the Communicable Disease Control Fund.
- The Canadian Agency for Public Health should give priority to strengthening the capacity of provincial/territorial laboratories as regards testing for infectious diseases. The Agency should provide incentives to increase the participation of provincial public health laboratories in national programs. It should support provincial/territorial public health laboratories in the creation of provincial laboratory networks equivalent to the Canadian Public Health Laboratory Network; these would connect in turn to the national network. The relevant monies would flow from the Communicable Disease Control Fund.
- The Canadian Agency for Public Health should support participation and leadership in international laboratory networks by our national laboratories, thereby building on the success of the international collaboration in the response to SARS.
- Health Canada, in collaboration with provincial/territorial authorities, should sponsor a process that will lead to a shared vision for the development, incorporation, and evaluation of leading-edge technology in the public health laboratory system. Among the issues that require elucidation are the role of national systems for the real-time surveillance of infectious disease through molecular fingerprinting of micro-organisms, toxicology capacity to detect illnesses caused by the poisoning of natural environments and occupational hazards, and the potential for linking genetic testing and infectious disease surveillance in novel programs that would target cofactors associated with the development of chronic diseases.
- A national report card of performance and gap assessment for public health laboratories should be developed through the Canadian Public Health Laboratory Network and/or the F/P/T Network for Communicable Disease Control, allowing comparative profiling of various provincial and national laboratories against international standards.

12B.8 Building Research Capacity

- The Canadian Agency for Public Health should earmark substantial funding to augment national capacity for research into epidemiologic and laboratory aspects of emerging infectious diseases and other threats to population health. This enhanced national public health science capacity should be strongly linked to academic health institutions through co-location, joint venture research institutes, cross appointments, joint recruitment, interchange, networks and collaborative research activities.
- The Canadian Agency for Public Health, in partnership with provincial/territorial governments and through the F/P/T Network for Communicable Disease Control, should directly invest in provincial, territorial, and regional public health science capacity.
- The F/P/T Network for Communicable Disease Control, in partnership with the CIHR and the Canadian research community, should develop clear protocols for leadership and coordination of future epidemic research responses.
- The Canadian Agency for Public Health and the F/P/T Network for Communicable Disease Control should ensure that epidemic response teams initiated as part of the Health Emergency Response Team [HERT] concept, provide not only surge capacity for outbreak containment per se, but also a mobile "B-team" and investigative infrastructure, including epidemiologists, programmers, and analysts.

- The Canadian Agency for Public Health, in partnership with provincial/territorial governments, should develop clear rules, reinforced by intergovernmental agreements, on the sharing of information, the establishment of national databases, and the use of biologic materials for research in response to epidemics.
- The Canadian Agency for Public Health, in collaboration with the CIHR, should establish a task force on emerging infectious diseases to recommend research priorities and funding mechanisms. The Agency, in collaboration with the CIHR and other national research funding bodies, should support the development of special funding mechanisms and processes for fast-tracking research related to epidemics of infectious diseases.
- The Canadian Agency for Public Health, in partnership with research agencies and provincial/territorial governments, should work with universities to improve research training opportunities in infectious diseases and outbreak management for the full range of involved disciplines. This capacity-building focus should be a priority within the broader health human resource strategy of the Agency.
- The Government of Canada should strengthen its R&D functions in international health outreach, with particular emphasis on emerging infectious diseases on a global basis.
- The Government of Canada should foster workable public-private partnerships with the biotechnology, information technology, and pharmaceutical industries for shared research interests in the realm of emerging infectious diseases, including new vaccines, antiviral compounds, immunotherapies, and diagnostic technology.

12B.9 Renewing Human Resources for Public Health

- Health Canada should engage provincial/territorial departments/ministries of health in immediate discussions around the initiation of a national strategy for the renewal of human resources in public health. This F/P/T strategy should be developed in concert with a wide range of non-governmental partners, and include funding mechanisms to support public health human resource development on a continuing basis.
- Health Canada should catalyze this strategy by urgently exploring opportunities to create and support training positions and programs in various public health-related fields where there are shortfalls in workforces (e.g., community medicine physicians, field epidemiologists, infection control practitioners, public health nursing, and others).
- The Canadian Agency for Public Health should develop a National Public Health Service, with a variety of career paths and opportunities for Canadians interested in public health. The National Public Health Service should include an extensive program of secondments to and from provincial/territorial and local health agencies, with arrangements for mutual recognition of seniority and a range of collaborative opportunities for advancement.
- Educational institutions, in collaboration with teaching hospitals as applicable, should develop contingency plans to limit the adverse impact on their students and trainees from infectious disease outbreaks, while maximizing learning opportunities from these events. These plans should include communications, education regarding infection control, preparedness with appropriate protective gear, guidelines for support of students/trainees in quarantine or work-and-home isolation, strategies to limit the impact of impeded access to usual teaching and research sites, and guidelines for the involvement of students in the care of patients with serious infectious conditions.

12B.10 International Issues

- The Government of Canada should take the lead, along with an international consortium of committed partners, in the detection of global emerging diseases and outbreaks. This should be done through enhancements to the Global Public Health Intelligence Network and similar programs.
- The Canadian Agency for Public Health should have a mandate for greater engagement internationally in the emerging infectious disease field, including the initiation of projects to build capacity for surveillance and outbreak management in developing countries.
- The Canadian Agency for Public Health should be the institution responsible for direct communication with the World Health Organization, the US CDC, and other international organizations and jurisdictions. The Agency should disseminate within Canada information received from international organizations and jurisdictions on global health threats, and in turn, it would inform the World Health Organization and other jurisdictions of relevant Canadian events. During outbreak situations, the Agency would perform the role of liaising between Canadian and international organizations and jurisdictions to maximize mutual learning.

- The Government of Canada should review its travel screening techniques and protocols with a view to ensuring that travel screening measures are based on evidence for public health effectiveness, while taking into account the financial and human resources required for their implementation and sustained operation. The Government of Canada should also initiate a multilateral dialogue with other nations that are currently engaged in SARS travel screening to determine whether and when some or all of these measures should be modified or discontinued.
- The Government of Canada should seek the support of international partners to launch a multilateral process under the auspices of the World Health Organization that would set agreed-upon standards of evidence for the issuance of travel advisories and alerts by member states. The multilateral process should also seek to determine the role of WHO in issuing travel advice, and to establish a procedure for providing advance notice for possible alerts and advice. The notice process should provide a mechanism for consultation with and a response by the target country.
- The Government of Canada should ensure that an adequate complement of quarantine officers is maintained at airports and other ports of entry, as required. Fully trained and informed quarantine officers should be available at airports to deal with health threats, to provide information to and educate airport staff, customs officials, and airline personnel concerning the recognition of illness and measures to be taken to contain risk. Close collaboration with airport authorities and airline personnel to clarify responsibilities in the event of a health threat is necessary.
- The Government of Canada should ensure that incoming and outgoing passengers are provided with health information about where and when health threats exist, including any precautionary measures to take, how to identify symptoms of the disease, and what first steps to take in case of suspected infection. A partnership with the travel industry would facilitate this process so that information could be provided at the time of bookings. The current Health Canada web site containing information for travelers should be made more prominent and its existence promoted.
- All federal/provincial/territorial/municipal response plans should include port/cruiseship- and airport/airplane-specific protocols for infectious diseases as well as protocols for employee protection guidelines and decontamination of aircraft, ships, and/or facilities. Jurisdictional issues concerning travel and health need to be resolved through the plan. The plan should be developed with input and buy-in from local health officials, response agencies, ports, airports and the relevant companies in the shipping and airline industries.

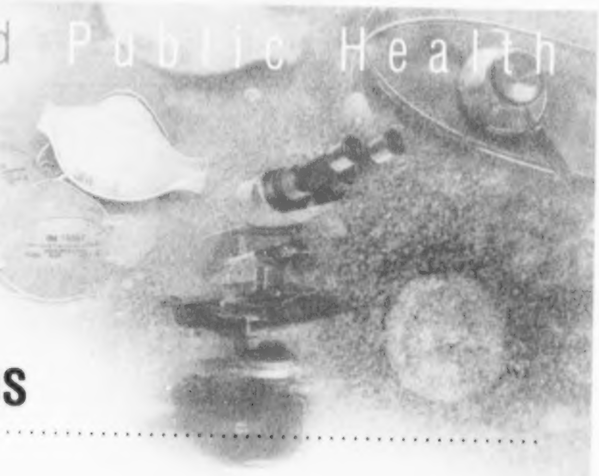
12B.11 Clinical and Local Public Health Issues

- F/P/T departments/ministries of health should facilitate a dialogue with health care workers, their unions/associations, professional regulatory bodies, experts in employment law and ethics, and other pertinent government departments/ministries concerning duties of care toward persons with contagious illnesses and countervailing rights to refuse dangerous duties in health care settings.
- The CEOs of hospitals and health regions should ensure that there is a formal Regional Infectious Disease Network that can design and oversee implementation of hospital strategies for responding to outbreaks of infectious disease. These Networks should map out programs of hospital surveillance for infectious diseases that cross-link institutions and connect in turn to a national surveillance program so as to integrate hospital and community-based information.
- As part of its activities, the F/P/T Network for Emergency Preparedness and Response should examine provincial and federal emergency measures with a view to ensuring that all emergency plans include a clear hierarchy of response mechanisms ranging from the response of a single ministry to a response from the entire government, with appropriate cross-linkages.
- Provincial/territorial ministries and departments of health should ensure that emergency plans include provisions for appropriate compensation of those individuals required to respond to and those affected by an emergency.
- Provincial/territorial ministries and departments of health should revise their statutes and regulations to require that every hospital or health region has formalized and updated protocols for outbreak management. These plans must include mechanisms for getting information and supplies to those outside the institutional sector, such as primary care physicians, ambulance personnel/paramedics, and community care providers.
- The CEO of each hospital or health region should ensure that each hospital's protocol for outbreak management incorporates an understanding of the hospital's interrelationships with local and provincial public health authorities.

- The CEO and relevant clinical chiefs of each hospital or health region should ensure that there is continuing education for hospital staff, particularly front-line health care workers, to enhance awareness of outbreak/infectious disease issues and institutional/clinical infection control.
- Provincial/territorial ministries and departments of health should ensure that all key health leaders are trained in crisis communications. Hospital and health region CEOs in turn should ensure that clinical leaders and key administrators are also trained in crisis communications and that the organization has a clear cut protocol for providing all relevant information to staff and hearing their concerns in a timely, respectful, and participatory fashion.
- Provincial/territorial ministries and departments of health should require through regulation and provide funding to ensure that emergency departments have the physical facilities to isolate, contain and manage incidents of infectious disease. Emergency departments should also be equipped with appropriate infostructure to enable their participation in infectious disease surveillance networks, including receipt of all necessary national and international alerts.
- Provincial/territorial ministries and departments of health should provide the necessary funding for renovation to achieve minimal facility standards for infection control in emergency departments.
- Provincial/territorial ministries and departments of health should ensure that each hospital has sufficient negative pressure rooms for treatment of patients with infectious disease.
- Provincial/territorial ministries and departments of health should ensure that, for emergency situations, at least one hospital in each 'region' of a province/territory has sufficient facilities and other infrastructure to serve as a regional centre to anchor the response to outbreaks of infectious disease.
- Provincial/territorial ministries and departments of health should ensure that systems are developed to ensure that providers and the public receive timely, accurate and consistent information and directives during an outbreak of infectious disease.
- Public health managers and facility/regional health authority CEOs, in collaboration with relevant unions, professional associations and individuals, should create a process/mechanism to include front-line public health and health care workers in advance planning to prepare for related to outbreaks of infectious diseases and other health emergencies. Occupational health and safety issues should be given prominence in this process.
- Provincial/territorial ministries and departments of health should engage the Canadian Council for Health Services Accreditation to work with appropriate stakeholders to strengthen infection control standards, surveyor guidelines and tools that are applicable to emergency services as well as outbreak management within health care institutions. The standards should also include descriptors of the appropriate expertise required to maintain hospital infection control.

12C. Postscript

The SARS story as it unfolded in Canada had both tragic and heroic elements. The toll of the epidemic was substantial, but thousands in the health field rose to the occasion and ultimately contained the SARS outbreak in this country. The Committee emphasizes that in drawing lessons from the SARS outbreak, our intent has been not to 'name, shame, and blame' individuals, but rather to move and improve systems that were suboptimal. The challenge now is to ensure not only that we are better prepared for the next epidemic, but that public health in Canada is broadly renewed so as to protect and promote the health of all our citizens. It is to these latter ends that the Committee's recommendations have been offered. We believe the recommendations represent a reasonably comprehensive and affordable starting point for strengthening and integrating public health at all levels in Canada. As our colleagues in government contemplate these recommendations, the Committee commends to them the vision of Benjamin Disraeli (1804-1881) who, on introducing his Public Health Act to British Parliament in 1875, remarked that public health was the foundation for "the happiness of the people and the power of the country. The care of the public health is the first duty of a statesman." Less eloquently, the Committee in closing repeats the simple question we put earlier to all health ministers, finance ministers, and first ministers: If not now, after SARS, when?



Appendix 1

INTERVIEWS AND SUBMISSIONS

As part of the Committee's fact finding phase, it conducted interviews with front-line health care providers and administrators, as well as personnel from various organizations and levels of government involved in managing the SARS outbreak. The Committee also put out a call for submissions to health care associations, non-governmental organizations, and relevant industry stakeholders. The call for submissions offered these groups an opportunity to relay their experiences with SARS, the lessons they learned from the outbreak, and their views on how the public health system needs to be improved.

The following are lists of individuals that were interviewed and submissions that were received.

INTERVIEWS

Interviewee	Affiliation	Date
Dr. Ian Johnson	Dept. of Public Health Sciences, UofT	June 3
Dr. Mary Vearncombe Dr. Anita Rachlis Dr. Andrew Simor	Director, Infection Control, SWCHSC Infectious Disease Consultant, SWCHSC Infectious Disease Consultant, SWCHSC	June 6
Prof. Sujit Choudhry	Faculty of Law, UofT	June 13
Prof. Harvey Skinner	Dept. of Public Health Sciences, UofT	June 16
Dr. Mark Cheung	General Internal Medicine, SWCHSC	June 16
Mr. Doug Hunt Mr. Justice Archie Campbell	Counsel to Public Health Investigation Investigator under the Public Health Act	June 17, July 11, August 18
Mr. Frank Lussing Mr. Malcolm Moffatt	CEO York Central Hospital (Committee member) CEO St. John's Rehabilitation	June 18
Dr. Ronn Goldberg	Radiologist-in-chief, North York General Hospital	June 19
Ms. Janet Beed Ms. Janet Davidson	VP, COO – Toronto General Hospital President, Toronto East General	June 20
Dr. Raziel Gershater	Radiologist, North York General Hospital	June 24

Interviewee	Affiliation	Date
Mr. Bill Tholl Dr. Dana Hanson Dr. Isra Levy	CEO, CMA President, CMA Director of Public Health, CMA	June 24
Dr. Denise Werker Dr. Arlene King	WHO CDS, Geneva Director of Immunization and Respiratory Diseases, Population and Public Health Branch, Health Canada	June 25, June 26
Ms. Pegeen Walsh	Special Advisor to Regional Director General Health Canada-Ontario/Nunavut Region	June 25
Dr. Bob Lester	Executive VP - SWCHSC	June 25
Dr. James Young	Commissioner of Public Safety	June 26
Dr. Rob Horvath	Assistant Director, Emergency Services, North York General Hospital	July 1
Dr. John Frank	Scientific Director, Institute for Population and Public Health, CIHR	July 2
Dr. David Mowat	Director-General of the Centre for Surveillance Coordination, Population and Public Health Branch, Health Canada	July 3
Dr. Don Low Dr. Allison McGeer	Microbiologist-in-Chief, Mt. Sinai Hospital Director, Infection Control, Mt. Sinai Hospital (Committee member)	July 3
Dr. Richard Schabas	Chief of Staff, York Central Hospital	July 3
Dr. Colin D'Cunha	Commissioner of Public Health, OMHLTC	July 7
Dr. Kumanan Wilson	General Internal Medicine, UHN & Institute of Intergovernmental Relations, Queen's University	July 7
Mr. Gerry Dafoe Dr. David Mowat	CEO, CPHA Health Canada	July 8
Ms. Gail Paech Mr. Phil Jackson	Assistant Deputy Minister - Long-term Care, OMHLTC Director, Health Information and Science Branch, OMHLTC	July 8
Dr. Paul Gully	Senior Director General, Population and Public Health Branch, Health Canada	July 9
Dr. Mona Loutfy	Infectious Disease Consultant, SWCHSC/ North York General	July 10
Mr. Tom Closson Dr. Michael Gardham Ms. Gillian Howard	CEO, UHN Director, Infection Control, UHN VP Public Affairs, UHN	July 11

Interviewee	Affiliation	Date
Dr. Bill Sibbald	Physician in Chief, SWCHSC	July 11
Dr. Phillip Ellison	Family Medicine, UHN	July 15
Dr. Barbara Mederski	Director of Infection Control, North York General Hospital	July 15
Ms. Bonnie Adamson	CEO, North York General Hospital	July 23
Ms. Bonnie Adamson Dr. Keith Rose	CEO, North York General Hospital VP - Medical Affairs, North York General Hospital	July 31

Submissions

Association of Canadians Academic Health Care Organizations

Association of Nursing Directors and Supervisors of Ontario Health Agencies

British Columbia Ministry of Health Planning

Canada's Research-Based Pharmaceutical Companies

Canadian Association of Emergency Physicians

Canadian Association of Medical Microbiologists

Canadian Coordinating Office for Health Technology Assessment

Canadian Council on Health Services Accreditation

Canadian Federation of Nurses Unions

Canadian Healthcare Association

Canadian Hospital Epidemiology Committee

Canadian Infectious Disease Society

Canadian Institutes of Health Research

Canadian Medical Association

Canadian Pharmacists Association

Canadian Public Health Association

Canadian Society for Medical Laboratory Science

Catholic Health Association of Canada

Community and Hospital Infection Control Association of Canada

Council of Chief Medical Officers of Health

Greater Toronto Airports Authority

Group of Nine National Associations[1]

National Specialty Society for Community Medicine

Ontario Association of Medical Laboratories

Ontario Council of Teaching Hospitals

Ontario Hospital Association

Ontario Medical Association

Royal College of Physicians and Surgeons of Canada

Vancouver International Airport Authority

VIA Rail Canada

Victorian Order of Nurses

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[1] Canadian Medical Association, the Canadian Public Health Association, the Canadian Nurses Association, the Canadian Healthcare Association, the Canadian Dental Association, the Association of Canadian Academic Healthcare Organizations, the Canadian Pharmacists Association, the Canadian Association of Emergency Physicians, and the Canadian Council on Health Services Accreditation.